NAVSHIPS 0967-239-4010

TECHNICAL MANUAL

FOR

TELEGRAPH TERMINAL AN/UCC-1D(V)

Published by direction of Commander, Naval Ship Systems Command

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TELEGRAPH TERMINAL

AN/UCC-1D(V)

This publication supersedes NAVSHIPS 0967-239-4010, dated 27 April 1967

Published by direction of Commander, Naval Ship Systems Command

Approved 24 December 1968

LIST OF EFFECTIVE PAGES

PAGE NUMBERS	CHANGE IN EFFECT
Title Page	Original
ii to ix	Original
1-0 to 1-19	Original
2-1 to 2-37	Original
3-1 to 3-8	Original
4-1 to 4-42	Original
5-1 to 5-40	Original
6-1 to 6-26	Original

NAVAL SHIP ENGINEERING CENTER NORFOLK DIVISION
NAVAL STATION
NORFOLK, VIRGINIA 23511

NOTE: This manual reflects the equipment changes made by Field Changes 1 through 3.

Errors found in this publication (other than obvious typographical errors) should be reported. Such report should include the complete title of the publication and the publication number. Identify the page and line or figure location of the error, and forward report to the Officer in Charge, Naval Ship Engineering Center, Norfolk Division, Naval Station, Norfolk, Virginia, 23511.

CHANGE RECORD

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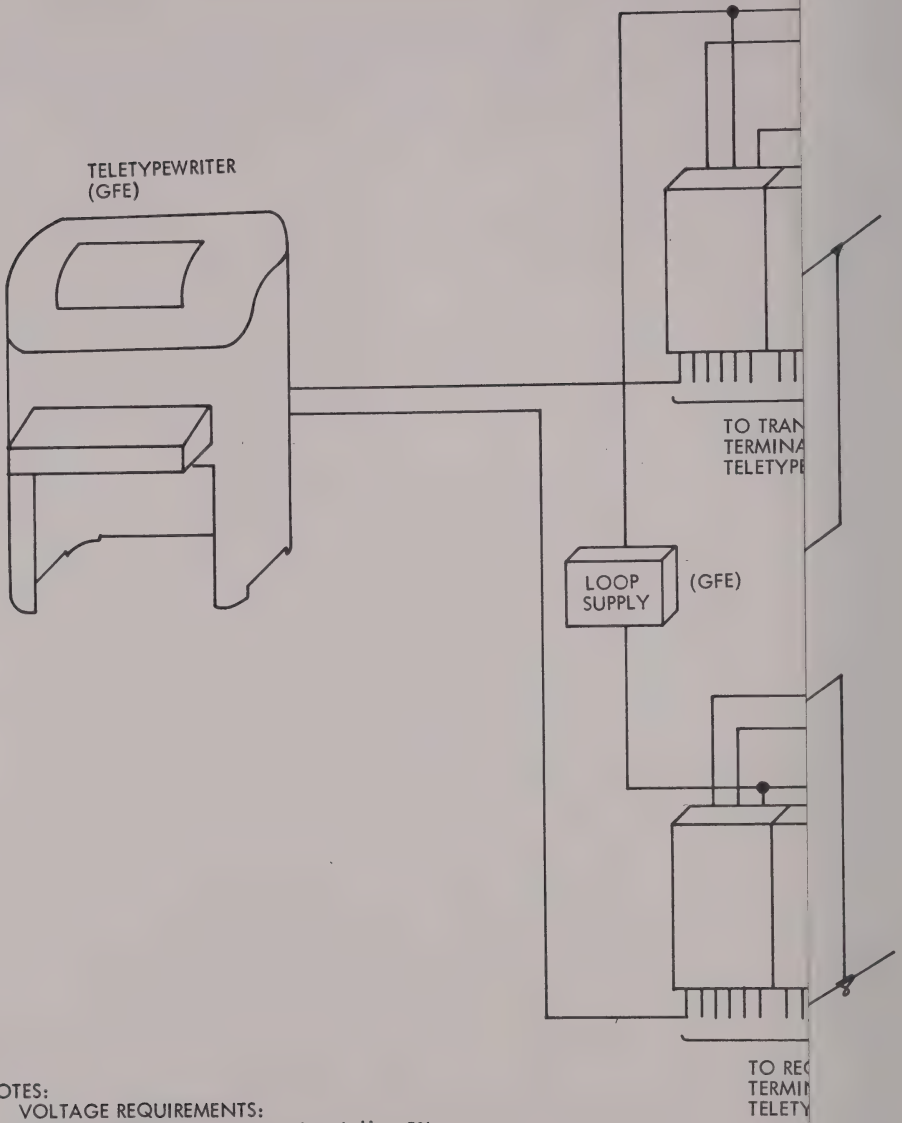


NOTES:
1. VOLTAGE REQUIREMENTS:
   115V OR 230V ±10%, 1ϕ, 50 OR 60 Hz ±5%
   POWER REQUIREMENTS:
   KEYER, FREQUENCY SHIFT KEYER KY-558A(P)/UCC-1C(V) - 9 WATTS
   CONVERTER FREQUENCY SHIFT CV-1920A(P)/UCC-1C(V) - 5.5 WATTS
   CONTROL ATTENUATOR C-6554A/UCC-1C(V) - 5 WATTS
   MULTIPLEXER-DEMULTIPLEXER TD-650/UCC-1V(V) - 20 WATTS (GFM)
   TEST SET, TELEGRAPH TS-2232A/UCC-1C(V) - 10 WATTS
2. POWER FACTOR -1
   CABLES 1W2, 1W5 ARE SUPPLIED.

Figure 1-1. Telegraph Terminal AN/UCC-1D(V), Relationship of Units

SECTION 1

GENERAL INFORMATION

1-1. SCOPE.

This manual describes Telegraph Terminal AN/UCC-1D(V), hereafter referred to as the Telegraph Terminal (see figure 1-1), its installation, operation, troubleshooting, maintenance, and parts list. This Technical Manual is in effect upon receipt. Extracts from this publication may be made to facilitate the preparation of other Department of Defense publications.

1-2. GENERAL DESCRIPTION.

a. The Telegraph Terminal is a modular carrier-telegraph equipment intended for use with single-sideband or twin-sideband radio circuits, voice-frequency wire lines, or microwave circuits.

b. The Telegraph Terminal comprises the following equipment:

(1) Cabinet, Electrical Equipment, CY-4639A/UCC-1C(V)
(2) Keyer, Frequency Shift, KY-588A(P)/UCC-1C(V).
(3) Converter, Frequency Shift, CV-1920A(P)/UCC-1C(V).
(4) Control-Attenuator, C-6554A/UCC-1C(V)
(5) Test Set, Telegraph, TS-2232A/UCC-1C(V)

Except for item (5), of which only one is required, component quantities are determined by installation requirements. Items (2), (3), and (4) are plug-in components that are mounted in item (1). Item (5) is a separate unit.

c. Depending upon the component quantities and configuration used, the Telegraph Terminal:

(1) Can provide up to 16 narrow-band channels within a 382-to-3017- Hz bandwidth. Within an 1870-to-3315- Hz bandwidth, a maximum of four wide-band channels (one per two narrow-band channels) are available.

(2) Can operate as a non-diversity, frequency-diversity, space-diversity, or r-f diversity system, or any combination thereof.

d. The Telegraph Terminal incorporates special testing equipment required for aligning its keying and converting circuitry.

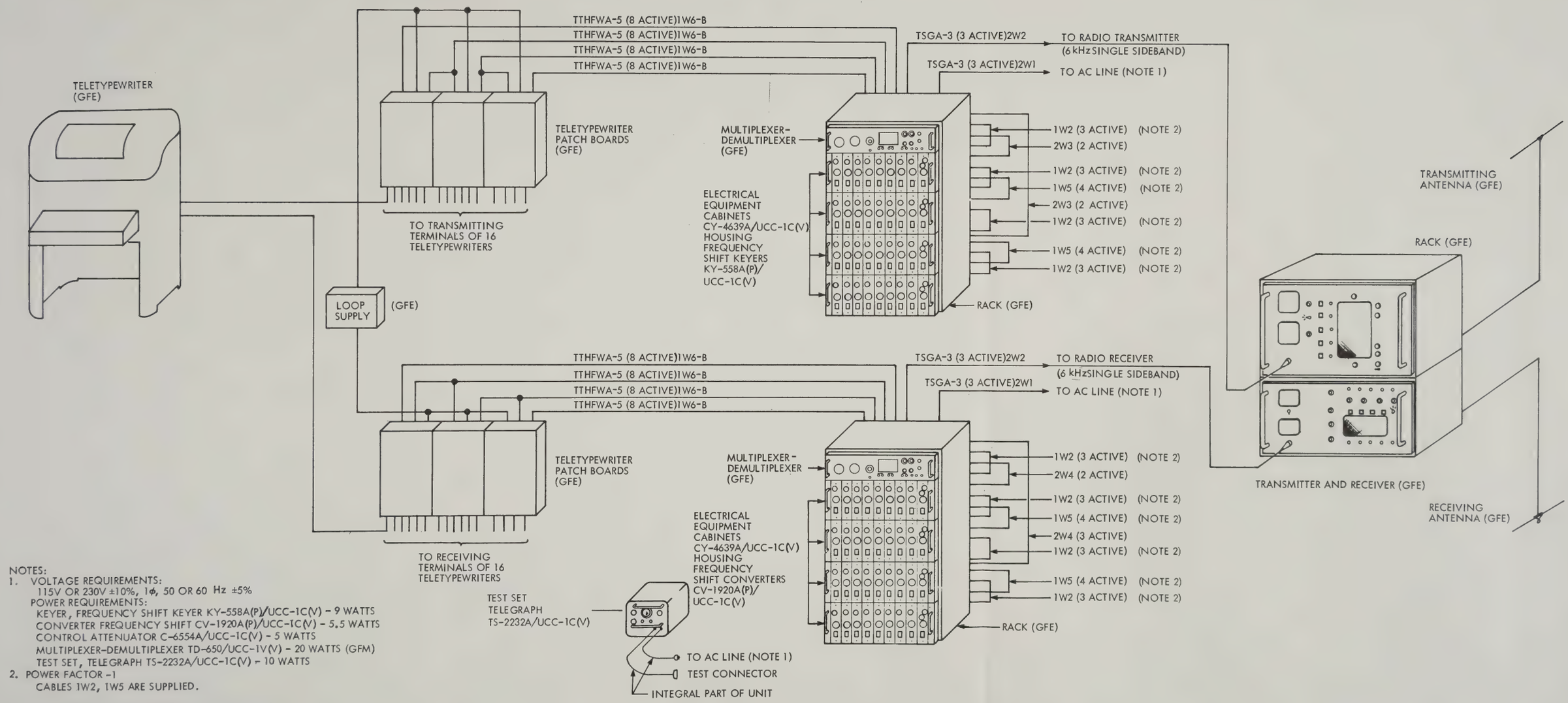
1-3. DESCRIPTION OF UNITS.

a. CABINET, ELECTRICAL EQUIPMENT, CY-4639A/UCC-1C(V), (see figure 1-2). - Each Cabinet used in the equipment houses one Control-Attenuator C-6554A/UCC-1C(V), and eight Frequency Shift Keyers KY-558A(P)/UCC-1C(V) or eight Frequency Shift Converters CV-1920A(P)/UCC-1C(V) (or any combination, totaling eight, of the latter two components). The L brackets supplied with the Cabinet allow standard 19-inch relay rack installation. Cabinet interconnector wiring permits diversity combinations, and connection of voice-frequency circuits to individual or parallel composite lines, by means of switch settings on the plug-in units.

b. KEYER, FREQUENCY SHIFT, KY-558A(P)/UCC-1C(V), (see figure 1-3). - Each Keyer provides one channel that accepts d-c telegraph signals from an external loop, and supplies the appropriate voice-frequency mark/space frequency-shift output signal. The Keyer provides polar or neutral loop operation without any change in switch settings. Keyer switches may be set to:

(1) Allow 20 or 60 ma neutral or low level (6V) polar operation,
(2) Provide normal or reversed voice-frequency signal sense,
(3) Place the output signal on an individual output line or on the composite output line,
(4) Enable interconnection of two Keyers, to form a frequency-diversity pair so that a single d-c telegraph input produces outputs at two different voice frequencies, and
(5) Enable interconnection of four Keyers to form a frequency-diversity combination so that a single d-c telegraph input produces outputs at four different voice frequencies.

The Keyer has its own power supply; all active Keyer components are contained on a plug-in printed-circuit card that is interchangeable with cards of other Keyers.


TELETYPEWRITER (GFE)
TTHFWA-5 (8 ACTIVE)1W6-B
TTHFWA-5 (8 ACTIVE)1W6-B
TTHFWA-5 (8 ACTIVE)1W6-B
TTHFWA-5 (8 ACTIVE)1W6-B
TELETYPEWRITER PATCH BOARDS (GFE)
TO TRANSMITTING TERMINALS OF 16 TELETYPEWRITERS
LOOP SUPPLY (GFE)
TSGA-3 (3 ACTIVE)2W2
TO RADIO TRANSMITTER (6 kHz SINGLE SIDEBAND)
TSGA-3 (3 ACTIVE)2W1
TO AC LINE (NOTE 1)
MULTIPLEXER-DEMULTIPLEXER (GFE)
ELECTRICAL EQUIPMENT CABINETS CY-4639A/UCC-1C(V) HOUSING FREQUENCY SHIFT KEYERS KY-558A(P)/UCC-1C(V)
1W2 (3 ACTIVE) (NOTE 2)
2W3 (2 ACTIVE)
1W2 (3 ACTIVE) (NOTE 2)
1W5 (4 ACTIVE) (NOTE 2)
2W3 (2 ACTIVE)
1W2 (3 ACTIVE) (NOTE 2)
1W5 (4 ACTIVE) (NOTE 2)
1W2 (3 ACTIVE) (NOTE 2)
RACK (GFE)
TTHFWA-5 (8 ACTIVE)1W6-B
TTHFWA-5 (8 ACTIVE)1W6-B
TTHFWA-5 (8 ACTIVE)1W6-B
TTHFWA-5 (8 ACTIVE)1W6-B
TELETYPEWRITER PATCH BOARDS (GFE)
TO RECEIVING TERMINALS OF 16 TELETYPEWRITERS
TSGA-3 (3 ACTIVE)2W2
TO RADIO RECEIVER (6 kHz SINGLE SIDEBAND)
TSGA-3 (3 ACTIVE)2W1
TO AC LINE (NOTE 1)
MULTIPLEXER-DEMULTIPLEXER (GFE)
ELECTRICAL EQUIPMENT CABINETS CY-4639A/UCC-1C(V) HOUSING FREQUENCY SHIFT CONVERTERS CV-1920A(P)/UCC-1C(V)
1W2 (3 ACTIVE) (NOTE 2)
2W4 (2 ACTIVE)
1W2 (3 ACTIVE) (NOTE 2)
1W5 (4 ACTIVE) (NOTE 2)
2W4 (3 ACTIVE)
1W2 (3 ACTIVE) (NOTE 2)
1W5 (4 ACTIVE) (NOTE 2)
1W2 (3 ACTIVE) (NOTE 2)
RACK (GFE)
TEST SET TELEGRAPH TS-2232A/UCC-1C(V)
TO AC LINE (NOTE 1)
TEST CONNECTOR
INTEGRAL PART OF UNIT
TRANSMITTING ANTENNA (GFE)
RACK (GFE)
TRANSMITTER AND RECEIVER (GFE)
RECEIVING ANTENNA (GFE)

NOTES:
1. VOLTAGE REQUIREMENTS:
   115V OR 230V ±10%, 1φ, 50 OR 60 Hz ±5%
   POWER REQUIREMENTS:
   KEYER, FREQUENCY SHIFT KEYER KY-558A(P)/UCC-1C(V) - 9 WATTS
   CONVERTER FREQUENCY SHIFT CV-1920A(P)/UCC-1C(V) - 5.5 WATTS
   CONTROL ATTENUATOR C-6554A/UCC-1C(V) - 5 WATTS
   MULTIPLEXER-DEMULTIPLEXER TD-650/UCC-1V(V) - 20 WATTS (GFM)
   TEST SET, TELEGRAPH TS-2232A/UCC-1C(V) - 10 WATTS
2. POWER FACTOR -1
   CABLES 1W2, 1W5 ARE SUPPLIED.

Figure 1-1. Telegraph Terminal AN/UCC-1D(V), Relationship of Units

SECTION 1

GENERAL INFORMATION

1-1. SCOPE.

This manual describes Telegraph Terminal AN/UCC-1D(V), hereafter referred to as the Telegraph Terminal (see figure 1-1), its installation, operation, troubleshooting, maintenance, and parts list. This Technical Manual is in effect upon receipt. Extracts from this publication may be made to facilitate the preparation of other Department of Defense publications.

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a. The Telegraph Terminal is a modular carrier-telegraph equipment intended for use with single-sideband or twin-sideband radio circuits, voice-frequency wire lines, or microwave circuits.

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(1) Cabinet, Electrical Equipment, CY-4639A/UCC-1C(V)
(2) Keyer, Frequency Shift, KY-588A(P)/UCC-1C(V).
(3) Converter, Frequency Shift, CV-1920A(P)/UCC-1C(V).
(4) Control-Attenuator, C-6554A/UCC-1C(V)
(5) Test Set, Telegraph, TS-2232A/UCC-1C(V)

Except for item (5), of which only one is required, component quantities are determined by installation requirements. Items (2), (3), and (4) are plug-in components that are mounted in item (1). Item (5) is a separate unit.

c. Depending upon the component quantities and configuration used, the Telegraph Terminal:

(1) Can provide up to 16 narrow-band channels within a 382-to-3017-Hz bandwidth. Within an 1870-to-3315-Hz bandwidth, a maximum of four wide-band channels (one per two narrow-band channels) are available.

(2) Can operate as a non-diversity, frequency-diversity, space-diversity, or r-f diversity system, or any combination thereof.

d. The Telegraph Terminal incorporates special testing equipment required for aligning its keying and converting circuitry.

1-3. DESCRIPTION OF UNITS.

a. CABINET, ELECTRICAL EQUIPMENT, CY-4639A/UCC-1C(V), (see figure 1-2). - Each Cabinet used in the equipment houses one Control-Attenuator C-6554A/UCC-1C(V), and eight Frequency Shift Keyers KY-558A(P)/UCC-1C(V) or eight Frequency Shift Converters CV-1920A(P)/UCC-1C(V) (or any combination, totaling eight, of the latter two components). The L brackets supplied with the Cabinet allow standard 19-inch relay rack installation. Cabinet interconnector wiring permits diversity combinations, and connection of voice-frequency circuits to individual or parallel composite lines, by means of switch settings on the plug-in units.

b. KEYER, FREQUENCY SHIFT, KY-558A(P)/UCC-1C(V), (see figure 1-3). - Each Keyer provides one channel that accepts d-c telegraph signals from an external loop, and supplies the appropriate voice-frequency mark/space frequency-shift output signal. The Keyer provides polar or neutral loop operation without any change in switch settings. Keyer switches may be set to:

(1) Allow 20 or 60 ma neutral or low level (6V) polar operation,
(2) Provide normal or reversed voice-frequency signal sense,
(3) Place the output signal on an individual output line or on the composite output line,
(4) Enable interconnection of two Keyers, to form a frequency-diversity pair so that a single d-c telegraph input produces outputs at two different voice frequencies, and
(5) Enable interconnection of four Keyers to form a frequency-diversity combination so that a single d-c telegraph input produces outputs at four different voice frequencies.

The Keyer has its own power supply; all active Keyer components are contained on a plug-in printed-circuit card that is interchangeable with cards of other Keyers.

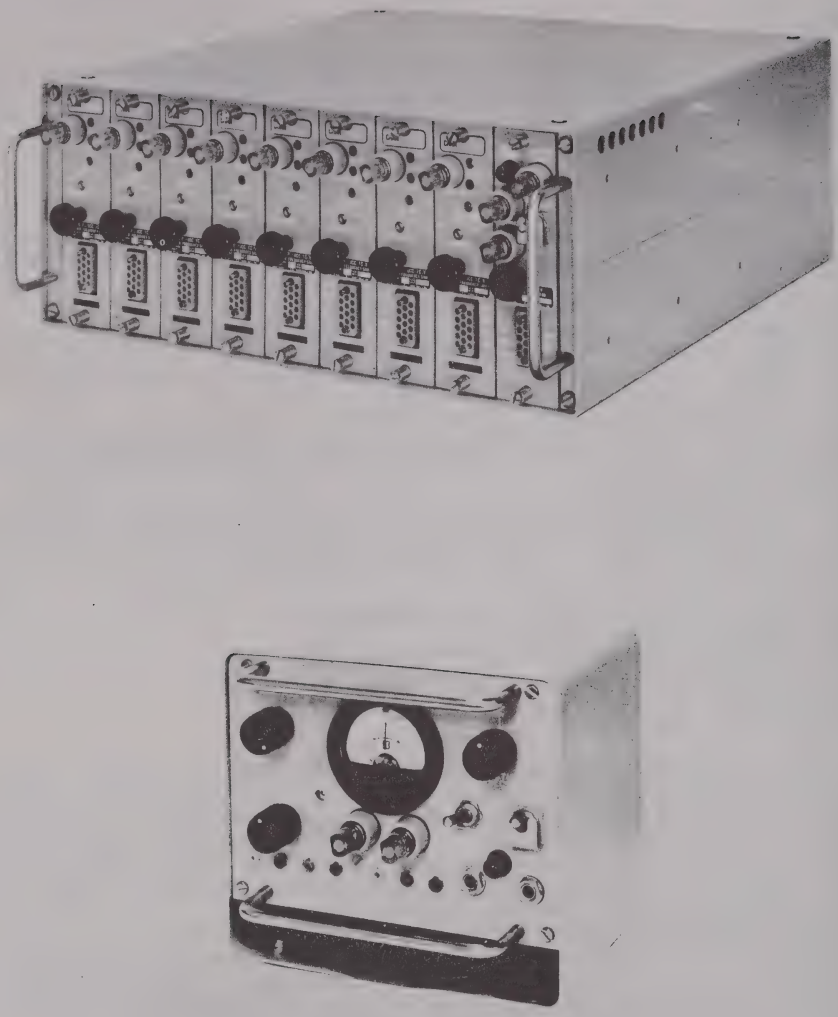

Figure 1-2. Telegraph Terminal AN/UCC-1D(V)

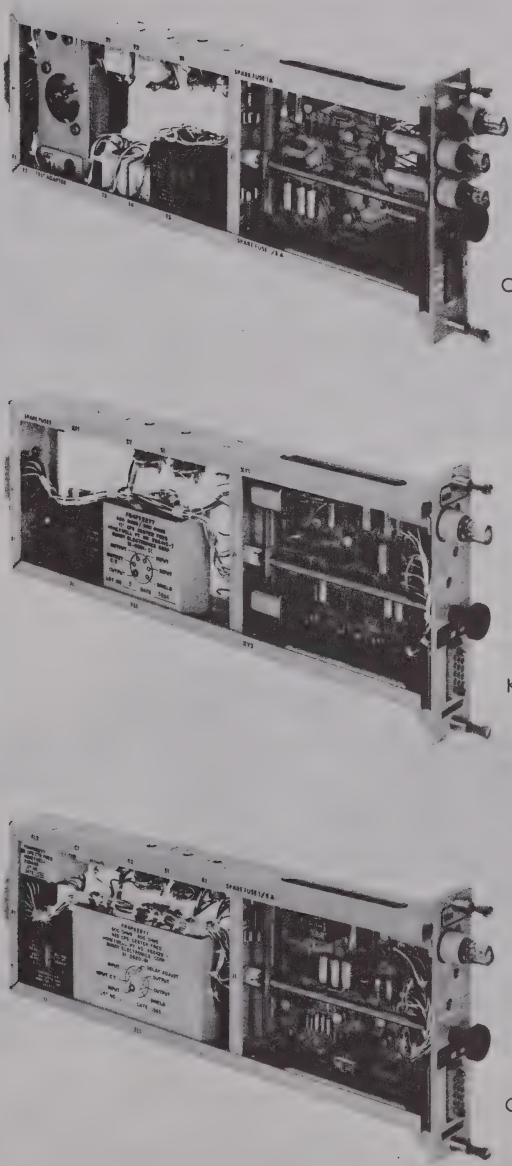

Figure 1-3. Keyer, Frequency Shift KY-558A(P)/UCC-1C(V), Converter, Frequency Shift CV-1920A(P)/UCC-1C(V), and Control-Attenuator C-6554A/UCC-1C(V)

c. CONVERTER, FREQUENCY SHIFT, CV-1920A(P)/UCC-1C(V), (see figure 1-3). - Each Converter provides one channel that accepts a particular frequency-shift voice-frequency signal, and produces an electronic keying signal for operation of a d-c telegraph loop. The Converter is capable of keying either neutral or low level polar loops. Switch settings allow the voice-frequency input to be obtained from either the composite line or an individual line, and allow connection of either two or four Converters to form diversity combinations. The Converter has its own power supply; all active Converter components are contained on a plug-in printed-circuit card that is interchangeable with cards of other Converters.

d. CONTROL-ATTENUATOR, C-6554A/UCC-1C(V), (see figure 1-3). - In the Control Attenuator, line power for the Cabinet-housed Keyers and Converters is fused and switched. The Unit has switches that permit:

(1) Selection of the Cabinet's mode of operation (master or slave) and

(2) Connection of the composite voice-frequency lines to the connectors at the rear of the Cabinet. Each unit also incorporates a constant level amplifier that maintains the composite output power at a constant level when up to sixteen tones having a combined peak power within the range of -24 to +18 dbm are combined. A control on the module panel allows adjustment of the composite output power level.

(3) A removable Test Adapter, Unit 1 A3 A2 located in Unit 1 A3, provides for testing for an individual Keyer, Converter, or Attenuator Module external to and independent of the Cabinet. See figure 1-4.

e. TEST SET, TELEGRAPH, TS-2232A/UCC-1C(V), (see figure 1-2). - The portable Test Set used for alignment and test of the other Telegraph Terminal units, provides facilities for:

(1) Tone-level measurement.

(2) Loop-Current measurement.

(3) Reversals generation (75 or 150 baud).

(4) Converter phase-distortion alignment.

(5) Audible-signal tracing (with speaker).

(6) Mark and Space Tone generation for 16 narrow-band and four wide-band channels.

The Test Set contains a panel-mounted d-c microammeter (marked in ma, volts, and dbm) and associated switching, a delay-adjustment network used in equalizing the phase delay in individual channels of a receiving diversity combination, a voice-frequency audio amplifier and loudspeaker that gives an audible indication of the v-f signal, a dot-cycle generator that provides electronic keying signals at rates of 75 or 150 baud for alignment of narrow- or wide-band channels, respectively, and a tone generator that generates the appropriate mark and space tones for the 16 narrow-band and four wide-band channels (40 tones total) respectively.

1-4. TYPICAL TERMINAL CONFIGURATIONS.

Typical terminal configurations using the Telegraph Terminal units are illustrated in figures 1-5 through 1-7.

a. Figure 1-5 shows a 16-channel space-diversity or r-f diversity terminal comprising 16 Keyers and 32 Converters (operating in a full duplex mode) housed in six Cabinets. The 16-channel space-diversity or r-f diversity terminal occupies 40.6 inches of vertical space.

b. Figure 1-6 shows a 16-channel non-diversity full-duplex terminal comprising 16 Keyers and 16 Converters housed in four Cabinets. The 16-channel non-diversity terminal occupies 27 inches of vertical space.

c. Figure 1-7 shows a 16-channel frequency-diversity full-duplex terminal. The transmitting combination (left stack) comprises 32 Keyers housed in four Cabinets. A Government-furnished Multiplexer-Demultiplexer used as a multiplexer is not shown. The receiving combination (right stack) comprises 32 Converters housed in four Cabinets. A Government-furnished Multiplexer-Demultiplexer used as a demultiplexer is not shown. The 16-channel frequency-diversity terminal occupies 54 inches of vertical space exclusive of the Multiplexer-Demultiplexers. The configuration can be stacked as shown in figure 1-7 or placed in one stack with the Multiplexer-Demultiplexers on top.

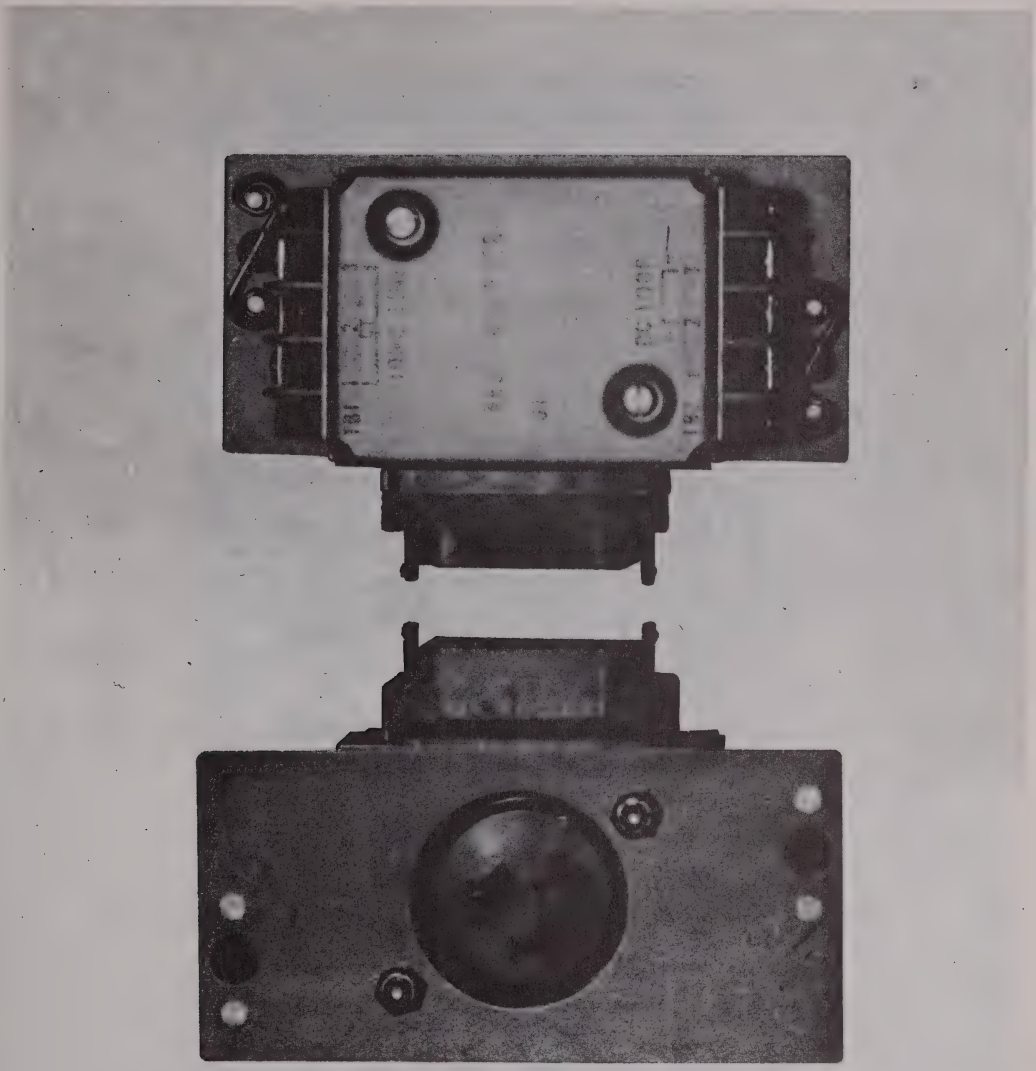

Figure 1-4. Test Adapter, Unit 1A3A2

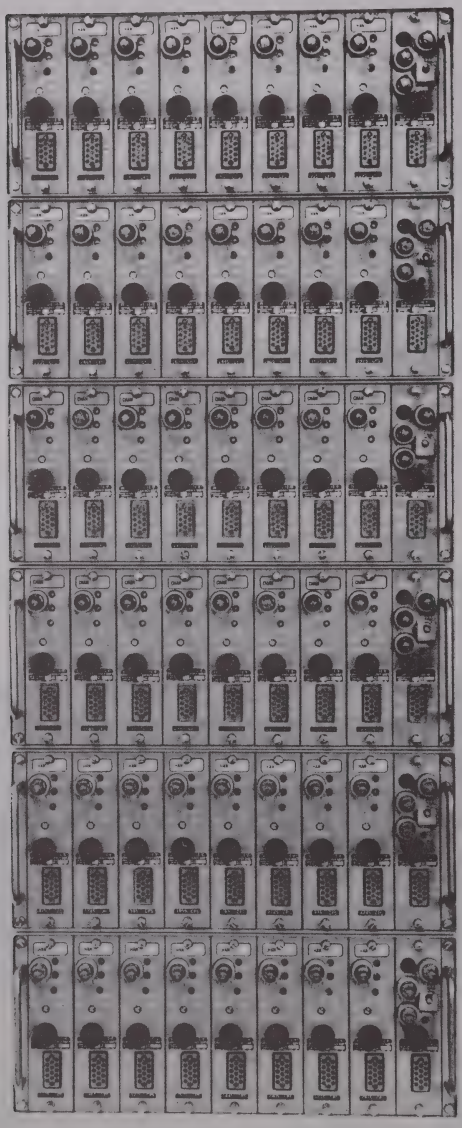

Figure 1-5. Sixteen-Channel Space Diversity or R-F Diversity Terminal

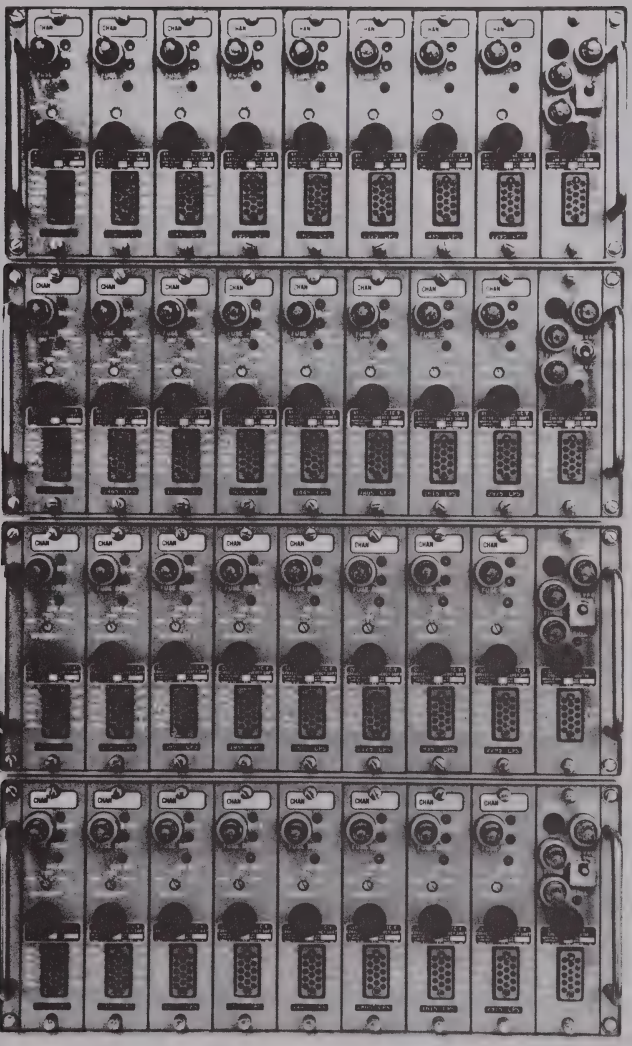

Figure 1-6. Sixteen-Channel Non-Diversity Terminal

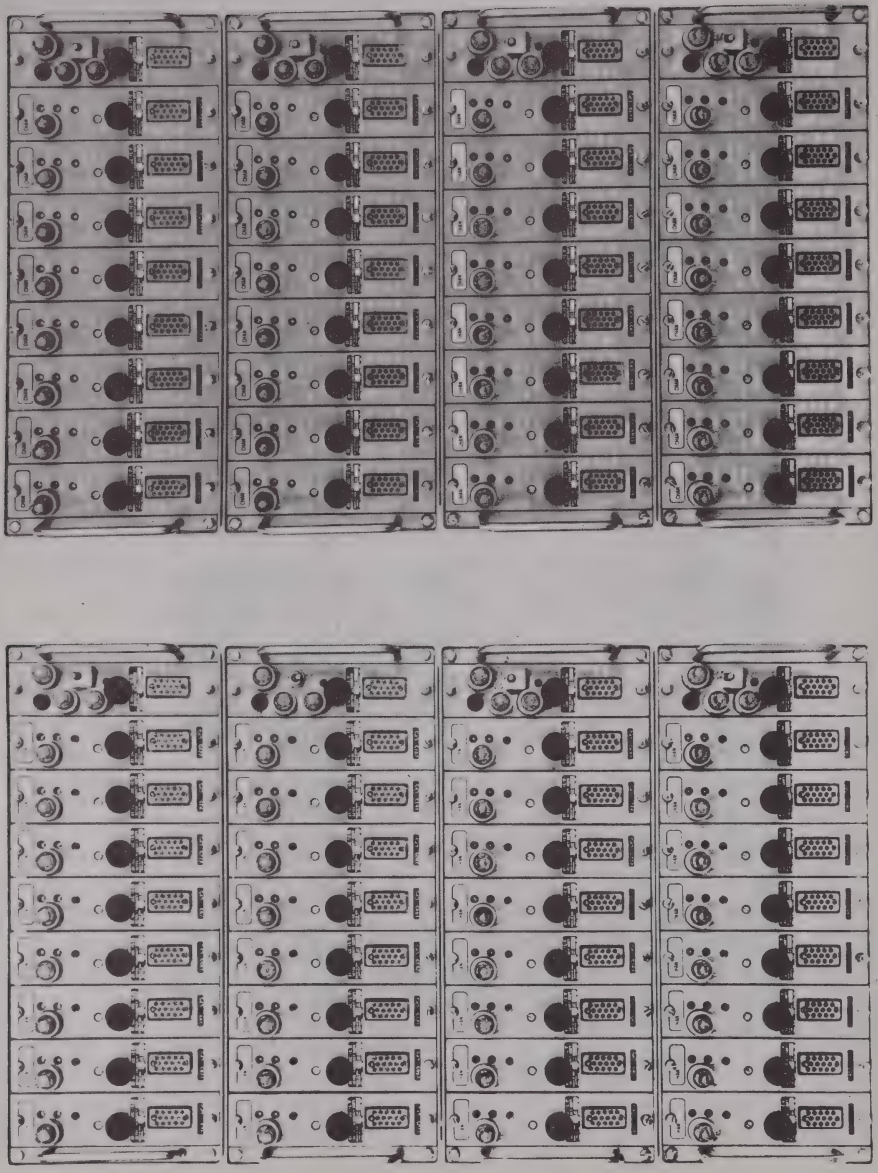

Figure 1-7. Sixteen-Channel Frequency-Diversity Terminal

1-5. TYPICAL SYSTEM CONFIGURATIONS.

Typical system configurations that can be established using Telegraph Terminal units are illustrated in figures 1-8 through 1-11.

a. Figure 1-8 shows an eight channel frequency-diversity, space-diversity system configuration.

(1) At the transmitter site, signals from eight telegraph loops are applied to eight frequency-diversity Keyer Pairs housed in two Cabinets. The composite 16-tone output (eight frequency-diversity pairs) is applied to the radio transmitter and sent over a radio link.

(2) At the receiver end, two radio receivers, arranged for space-diversity operation, are used to receive the radio signals, in order to obtain improved reception should fading exist at either one of the radio-receiver locations. Each diversity group comprises two frequency-diversity pairs of Converters, one pair per radio receiver. The outputs of the four Converters are compared and are used to key one telegraph loop. Thus, 32 Converters, housed in four Cabinets are used at the receiving end of the radio link.

b. Figure 1-9 shows a 16-channel frequency-diversity system, using a 6-kHz communication link. The system configuration shown is required to transmit signals from 16 telegraph loops in frequency-diversity, over a single 6-kHz communication link, and to receive these signals at the opposite end of the link.

(1) At the transmitter end, 32 Keyers, housed in four Cabinets, are used to obtain 16 frequency-diversity pairs. A Government-furnished Multiplexer-Demultiplexer operating as a multiplexer shifts the composite output of eight frequency-diversity pairs to the upper portion of the 6-kHz band, combining these on a common line with the unshifted composite signal of the other eight frequency-diversity pairs.

(2) At the receiving end of the link, another Government-furnished Multiplexer-Demultiplexer and 32 Converters, housed in four Cabinets, are used to reverse the process performed at the transmission end and to supply electronic keying for 16 telegraph loops.

c. Figure 1-10 shows a six-channel frequency-diversity full-duplex system. At each end of the link, 12 Keyers and 12 Converters are housed in three Cabinets. One Cabinet houses eight Keyers, a second houses four Keyers and four Converters, and a third houses eight Converters.

d. Figure 1-11 shows a four-channel frequency-diversity, r-f diversity system.

(1) At the transmitting end of the system, eight Keyers, housed in a Cabinet, are arranged to obtain four frequency-diversity pairs. The composite eight-tone output is coupled through a patch panel to radio transmitters A and B, which broadcast the information to radio receivers A and B, respectively. The radio transmitters and receivers operate on two different frequencies (designated "A" and "B"), thus obtaining the system's r-f diversity. R-F diversity operation improves reception in the presence of fading at either one of the r-f signal frequencies.

(2) At the receiving station, 16 Converters, housed in two Cabinets, are arranged to obtain four 4-channel frequency-diversity combinations. Each frequency-diversity channel comprises two frequency- diversity pairs, one operated by each of the radio receivers. The outputs of each of the four-channel frequency-diversity combinations key a single d-c telegraph loop.

1-6. REFERENCE DATA.

a. KEYING RATE	
(1) Narrow-band channel	75 bauds (nominal).
(2) Wide-band channel	150 bauds (nominal).
b. FREQUENCY STABILITY. (under all operating and environmental conditions).	±0.5 Hz for both mark and space frequencies on all channels.
c. TELEGRAPH LOOPS	
(1) Types of signals	
(a) Receive loops	Neutral or Polar.
(b) Send loops	Neutral or Polar.
(2) Loop current requirements	
(a) Neutral (HI)	20 or 60 ma.
(b) Polar (LO)	±6.0 volts dc.

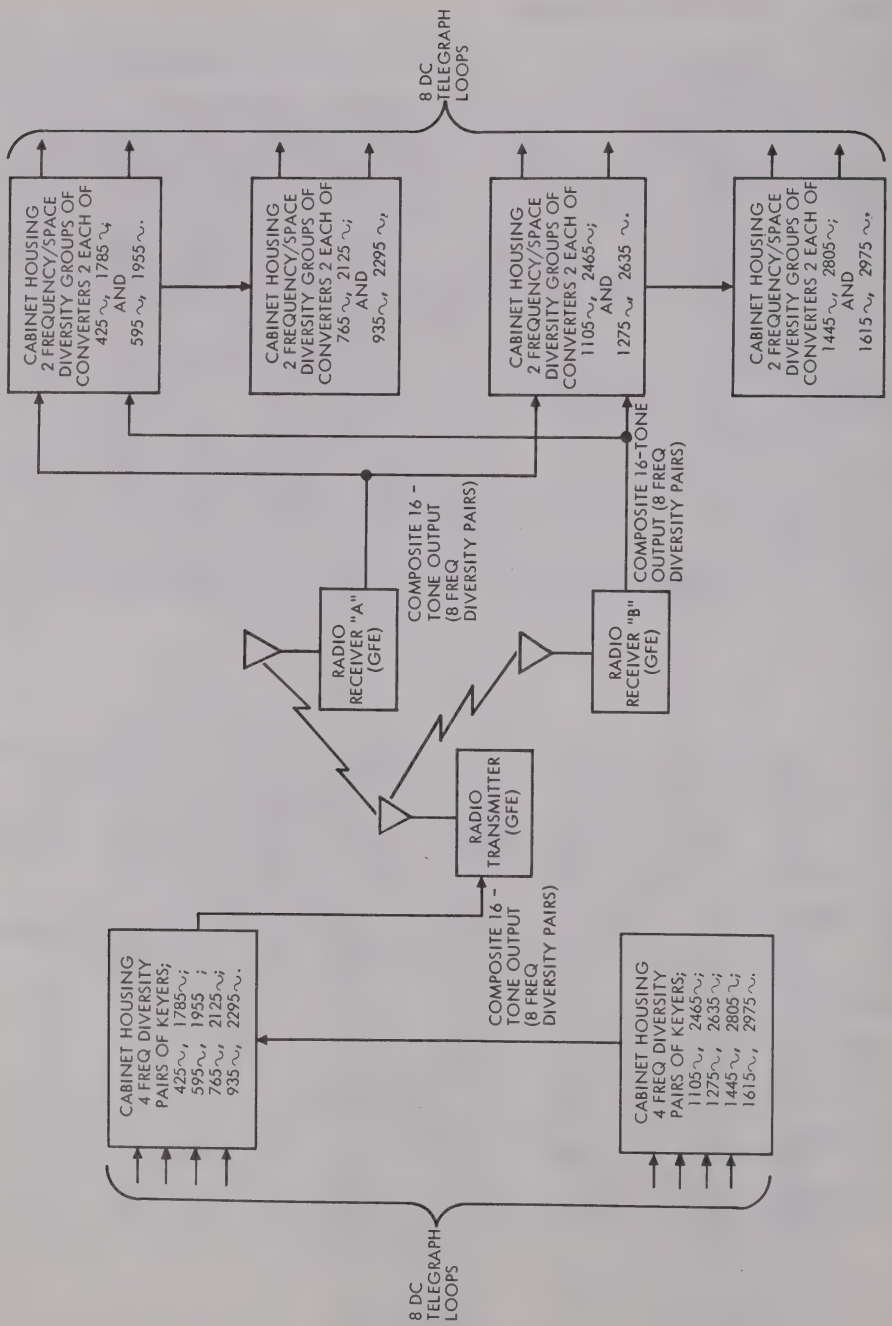
8 DC TELEGRAPH LOOPS
CABINET HOUSING 2 FREQUENCY/SPACE DIVERSITY GROUPS OF CONVERTERS 2 EACH OF 425 ~, 1785 ~ AND 595 ~, 1955 ~.
CABINET HOUSING 2 FREQUENCY/SPACE DIVERSITY GROUPS OF CONVERTERS 2 EACH OF 765 ~, 2125 ~; AND 935 ~, 2295 ~,
CABINET HOUSING 2 FREQUENCY/SPACE DIVERSITY GROUPS OF CONVERTERS 2 EACH OF 1105 ~, 2465 ~; AND 1275 ~, 2635 ~.
CABINET HOUSING 2 FREQUENCY/SPACE DIVERSITY GROUPS OF CONVERTERS 2 EACH OF 1445 ~, 2805 ~; AND 1615 ~, 2975 ~,
COMPOSITE 16-TONE OUTPUT (8 FREQ DIVERSITY PAIRS)
COMPOSITE 16-TONE OUTPUT (8 FREQ DIVERSITY PAIRS)
RADIO RECEIVER "A" (GFE)
RADIO RECEIVER "B" (GFE)
RADIO TRANSMITTER (GFE)
COMPOSITE 16-TONE OUTPUT (8 FREQ DIVERSITY PAIRS)
CABINET HOUSING 4 FREQ DIVERSITY PAIRS OF KEYERS; 425 ~, 1785 ~; 595 ~, 1955 ~; 765 ~, 2125 ~; 935 ~, 2295 ~.
CABINET HOUSING 4 FREQ DIVERSITY PAIRS OF KEYERS; 1105 ~, 2465 ~; 1275 ~, 2635 ~; 1445 ~, 2805 ~; 1615 ~, 2975 ~.
8 DC TELEGRAPH LOOPS

Figure 1-8. Eight-Channel Frequency-Diversity/Space Diversity System

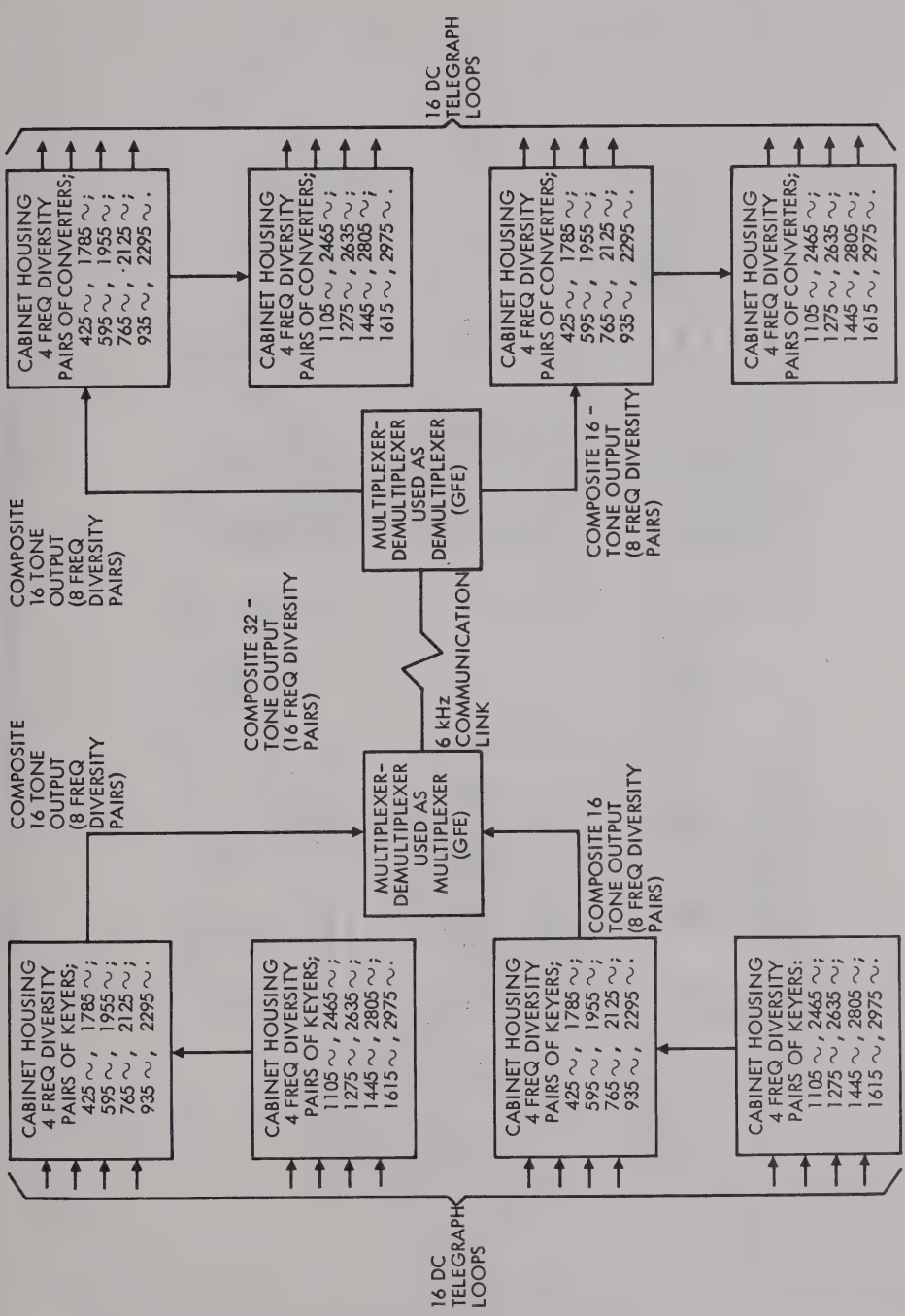
16 DC TELEGRAPH LOOPS
CABINET HOUSING 4 FREQ DIVERSITY PAIRS OF CONVERTERS; 425 ~ , 1785 ~ ; 595 ~ , 1955 ~ ; 765 ~ , 2125 ~ ; 935 ~ , 2295 ~ .
CABINET HOUSING 4 FREQ DIVERSITY PAIRS OF CONVERTERS; 1105 ~ , 2465 ~ ; 1275 ~ , 2635 ~ ; 1445 ~ , 2805 ~ ; 1615 ~ , 2975 ~ .
CABINET HOUSING 4 FREQ DIVERSITY PAIRS OF CONVERTERS; 425 ~ , 1785 ~ ; 595 ~ , 1955 ~ ; 765 ~ , 2125 ~ ; 935 ~ , 2295 ~ .
CABINET HOUSING 4 FREQ DIVERSITY PAIRS OF CONVERTERS; 1105 ~ , 2465 ~ ; 1275 ~ , 2635 ~ ; 1445 ~ , 2805 ~ ; 1615 ~ , 2975 ~ .
COMPOSITE 16 TONE OUTPUT (8 FREQ DIVERSITY PAIRS)
COMPOSITE 16 TONE OUTPUT (8 FREQ DIVERSITY PAIRS)
MULTIPLEXER-DEMULTIPLEXER USED AS DEMULTIPLEXER (GFE)
COMPOSITE 32 - TONE OUTPUT (16 FREQ DIVERSITY PAIRS)
6 kHz COMMUNICATION LINK
COMPOSITE 16 - TONE OUTPUT (8 FREQ DIVERSITY PAIRS)
MULTIPLEXER-DEMULTIPLEXER USED AS MULTIPLEXER (GFE)
CABINET HOUSING 4 FREQ DIVERSITY PAIRS OF KEYERS; 425 ~ , 1785 ~ ; 595 ~ , 1955 ~ ; 765 ~ , 2125 ~ ; 935 ~ , 2295 ~ .
CABINET HOUSING 4 FREQ DIVERSITY PAIRS OF KEYERS; 1105 ~ , 2465 ~ ; 1275 ~ , 2635 ~ ; 1445 ~ , 2805 ~ ; 1615 ~ , 2975 ~ .
CABINET HOUSING 4 FREQ DIVERSITY PAIRS OF KEYERS; 425 ~ , 1785 ~ ; 595 ~ , 1955 ~ ; 765 ~ , 2125 ~ ; 935 ~ , 2295 ~ .
CABINET HOUSING 4 FREQ DIVERSITY PAIRS OF KEYERS: 1105 ~ , 2465 ~ ; 1275 ~ , 2635 ~ ; 1445 ~ , 2805 ~ ; 1615 ~ , 2975 ~ .
COMPOSITE 16 TONE OUTPUT (8 FREQ DIVERSITY PAIRS)
16 DC TELEGRAPH LOOPS

Figure 1-9. Sixteen-Channel Frequency-Diversity System, Using a Six-kHz Bandwidth Communications Link

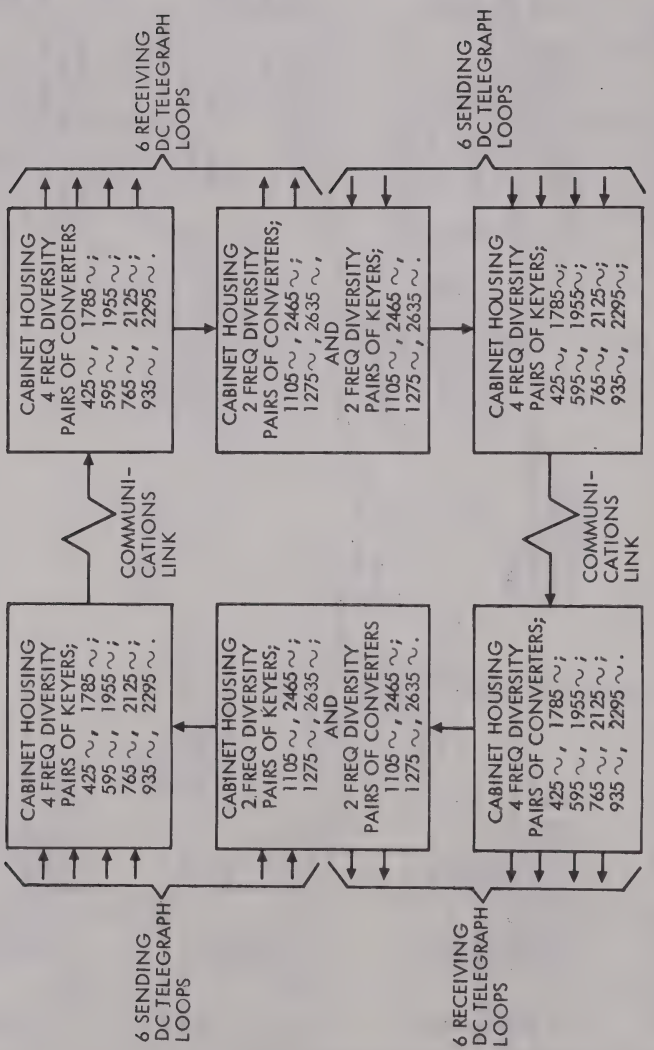

Figure 1-10. Six-Channel Frequency-Diversity System

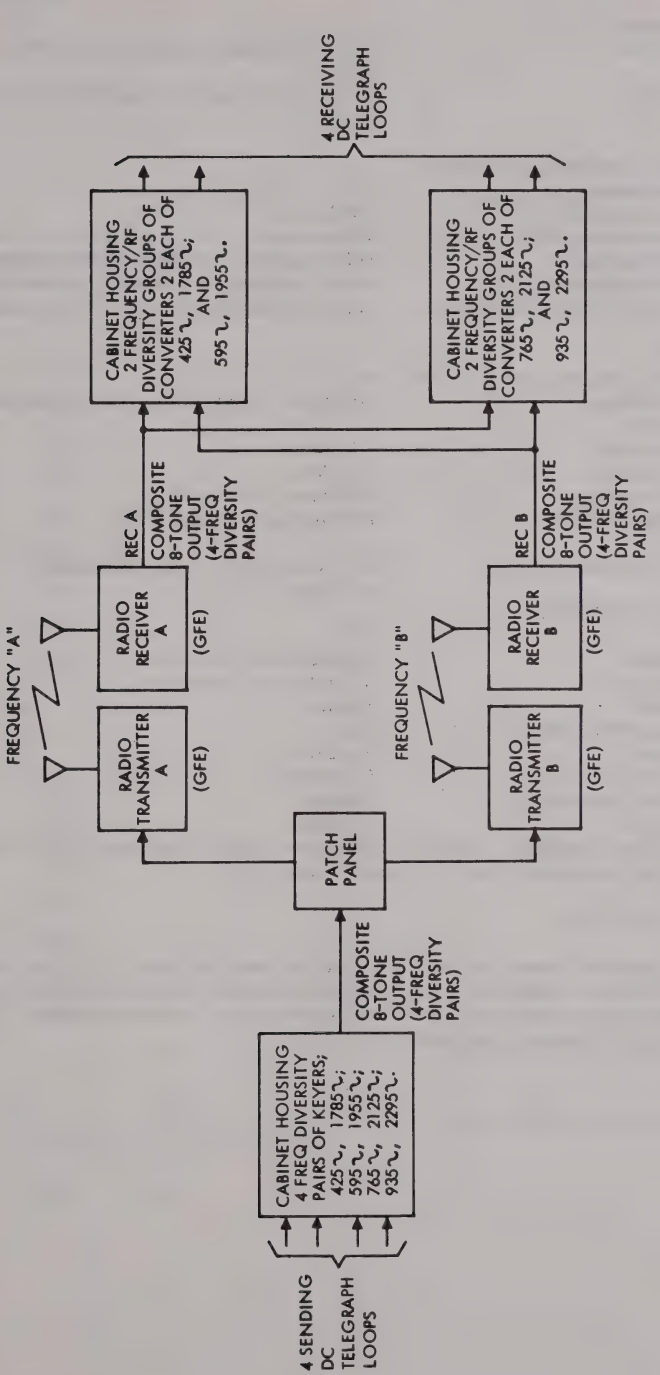
4 SENDING DC TELEGRAPH LOOPS
CABINET HOUSING 4 FREQ DIVERSITY PAIRS OF KEYERS; 425 ~, 1785 ~; 595 ~, 1955 ~; 765 ~, 2125 ~; 935 ~, 2295 ~.
COMPOSITE 8-TONE OUTPUT (4-FREQ DIVERSITY PAIRS)
PATCH PANEL
RADIO TRANSMITTER A
(GFE)
RADIO TRANSMITTER B
(GFE)
FREQUENCY "A"
FREQUENCY "B"
RADIO RECEIVER A
(GFE)
RADIO RECEIVER B
(GFE)
REC A
COMPOSITE 8-TONE OUTPUT (4-FREQ DIVERSITY PAIRS)
REC B
COMPOSITE 8-TONE OUTPUT (4-FREQ DIVERSITY PAIRS)
CABINET HOUSING 2 FREQUENCY/RF DIVERSITY GROUPS OF CONVERTERS 2 EACH OF 425 ~, 1785 ~; AND 595 ~, 1955 ~.
CABINET HOUSING 2 FREQUENCY/RF DIVERSITY GROUPS OF CONVERTERS 2 EACH OF 765 ~, 2125 ~; AND 935 ~, 2295 ~.
4 RECEIVING DC TELEGRAPH LOOPS

Figure 1-11. Four-Channel Frequency-Diversity, R-F Diversity System

(3) Loop battery	
(a) Neutral	30-130 volts d-c supplied from external loop.
(b) Polar	±6 to ±7.5 volts d-c supplied from external loop.
d. KEYER	
(1) Number of channels per Cabinet	8.
(2) Input resistance	
(a) Polar loop (LO)	5000 ohms.
(b) Neutral loop (HI)	100 ohms.
(3) Output termination	600 ohms, ungrounded, center-tapped.
(4) Individual output levels	-24 to +6 dbm, continuously adjustable.
(5) Composite, Control-Attenuator output range	-38 to +6 dbm, continuously adjustable.
e. CONVERTER.	
(1) Number of channels per Cabinet	8.
(2) Input impedance	600 ohms, ungrounded, center-tapped.
(3) Input levels	
(a) maximum	+10 dbm.
(b) minimum	-40 dbm.
(4) Output resistance	100 ohms maximum.
(5) Phase distortion (without adjustment)	2.0 millisecond maximum.
(6) Phase distortion control	0-3.5 ms delay range continuously variable.
f. POWER REQUIREMENTS.	
(1) Type	
(a) Voltage	115/230 ±10 percent.
(b) Frequency	50 or 60 Hz ±5 percent.
(c) Phase	Single.
(2) Power consumption (typical))	
(a) Keyer	9 watts.
(b) Converter	5.5 watts.
(c) Control Attenuator	5 watts.
(d) Test Set	10 watts.

g. CHANNEL FREQUENCIES. - Table 1-1 lists the channel frequencies of Telegraph Terminal. Table 1-2 lists the frequency-diversity combinations.

1-7. EQUIPMENT SUPPLIED.

The equipment supplied for the Telegraph Terminal is listed in Table 1-3. Note that the Telegraph Terminal is a variable equipment, the quantities and types of units supplied varying as required. Table 1-4 provides a breakdown of the unit's transistor-diode complement. Table 1-5 lists the equipment and publications required but not supplied.

TABLE 1-1. CHANNEL FREQUENCIES*

CENTER FREQUENCY Hz	MARK FREQUENCY Hz	SPACE FREQUENCY Hz
425	467.5	382.5
595	637.5	552.5
765	807.5	722.5
935	977.5	892.5
1105	1147.5	1062.5
1275	1317.5	1232.5
1445	1487.5	1402.5
1615	1657.5	1572.5
1785	1827.5	1742.5
1955	1997.5	1912.5
2125	2167.5	2082.5
2295	2337.5	2252.5
2465	2507.5	2422.5
2635	2677.5	2592.5
2805	2847.5	2762.5
2975	3017.5	2932.5
**1955	2040	1870
**2380	2465	2295
**2805	2890	2720
**3230	3315	3145

*SIGNAL SENSE switch in NORMAL position. With SIGNAL SENSE switch in REVERSE position, interchange MARK and SPACE frequencies.

**Wide-band channels (±85 Hz).

TABLE 1-2. FREQUENCY-DIVERSITY COMBINATIONS*

NARROW-BAND (Hz)		
NORMAL COMBINATIONS	NORMAL AND REVERSE** COMBINATIONS	NARROW-WIDE BAND (Hz)
425-1785	425**-1785	425-1105
595-1955	595**-1955	595-1275
765-2125	765**-2125	765-1445
935-2295	935**-2295	935-1615
1105-2465	1105**-2465	
1275-2635	1275**-2635	
1445-2805	1445**-2805	
1615-2975	1615**-2975	

*These combinations are recommended so that a system utilizing a Telegraph Terminal AN/UCC-1D(V) at one station is compatible with a different Telegraph Terminal at another station in the system.

**To use the NORMAL/REVERSE Diversity Combinations, the SIGNAL SENSE switch on channels 425 Hz thru 2975 must be set to the REVERSE position.

TABLE 1-3. EQUIPMENT SUPPLIED

QTY PER EQUIP.	NOMENCLATURE		COMMON NAME	OVER-ALL DIMENSIONS (IN.)	VOLUME (CU FT)	WEIGHT (LB)
	NAME	DESIGNATION				
As Required	Cabinet Electrical Equipment	CY-4639A/ UCC-1C(V)	Cabinet	6.76" h by 16.72" w* by 17.88 d	1.17	15
As Required	Keyer Frequency Shift	KY-558A(P)/ UCC-1C(V)	Keyer	6.5"h by 1.625" w by 15.35" d	0.076	5
As Required	Converter, Frequency Shift	CV-1920A(P)/ UCC-1C(V)	Converter	6.5" h by 1.625" w by 15.35"d	0.076	6
As Required	Control-Attenuator	C-6554A/ UCC-1C(V)	Control-Attenuator	6.5" h by 1.625" w by 15.35" d	0.076	3-1/2
1	Test Set, Telegraph	TS-2232A/ UCC-1C(V)	Test Set	7" h by 8" w by 7-1/2" d	0.22	10
2	Technical Manual for Telegraph Terminal AN/ UCC-1D(V)	NAVSHIPS 0967-239-4010		11-1/2" h by 9-1/2" w by 1-1/2" d	0.095	4

*Without L brackets which permit mounting in 19-inch relay rack.

TABLE 1-4. COMPLEMENT OF TRANSISTORS, DIODES, AND INTEGRATED CIRCUIT DEVICES

UNIT	ASSEMBLY	1N 483B	1N 645	1N 647	1N 748A	1N 750A	1N 754A	1N 756A	1N 914	1N 3022B	2N 1711	2N 3439	2N 2060	2N 412	2N 416
Keyer		3	6		1	2	3		2	1	7			2	7
Converter		18	2	2				1		1	8	1	2	4	
Control Attenuator		2	2							1	1		1	2	
Test Set	2A1	56			1						1				8
Test Set	2A2	7	5	4						1	2		1	1	
Test Set	2A3													1	

TABLE 1-5. EQUIPMENT AND PUBLICATIONS REQUIRED BUT NOT SUPPLIED

QUANTITY PER EQUIPMENT	NOMENCLATURE		REQUIRED USE
	NAME	DESIGNATION	
1	Electronic Multimeter	ME-6( )/U	Troubleshooting and maintenance procedures
1	Audio Oscillator	AN/URM127( )	Troubleshooting and adjustment procedures
1	Oscilloscope	AN/USM-117 ( )	Troubleshooting and maintenance procedures
1	Frequency Meter	AN/USM - 207( )	Troubleshooting and maintenance procedures.
1	Multimeter	AN/PSM 4 ( )	Troubleshooting and maintenance procedures
1	Instruction Book for Electronic Multimeter ME - 6 ( )/U	Applicable Instruction Book	
1	Instruction Book for Oscilloscope AN/USM - 117 ( )	Applicable Instruction Book	
1	Instruction Book for Frequency Meter AN/USM - 207( )	Applicable Instruction Book	
1	Instruction Book for Audio Oscillator AN/URM 127 ( )	Applicable Instruction Book	
1	Instruction Book for Multimeter AN/PSM 4 ( )	Applicable Instruction Book	

TERMS AND DEFINITIONS

ATTENUATION. The action by which, or the result in which, the power of an electrical signal is decreased; expressed in db.

BALANCED. Electrically symmetrical with respect to ground.

BAUD. The unit of modulation rate. One baud corresponds to a rate of unit interval per second. The modulation rate is expressed as the reciprocal of the duration in seconds of the unit interval. Example: If the duration of the unit interval is 20 milliseconds, the modulation rate is 50 bauds.

CHANNEL. A means of one-way transmission. Several channels may share a common path as in carrier systems; in this case each channel is allocated a particular frequency band which is reserved to it.

CHARACTER INTERVAL. The total number of unit intervals (including synchronizing, intelligence, error checking or control bits) required to transmit any given character in any given communications system. Extra bits which are not associated with individual charatcters are not included.

CIRCUIT. A means of bothway communication between two points, comprising associated "go" and "return" channels.

DISTORTION, BIAS. Distortion affecting a two-condition (or binary) modulation in which all the significant intervals corresponding to one of the two significant conditions have uniformly longer or shorter duration than the corresponding theoretical durations.

DISOTRTION, TELETYPEWRITER SIGNAL (of start-stop teletypewriter signals). The shifting of the transition points of the signal pulses from their proper positions relative to the beginning of the start pulse. The magnitude of the distortion is expressed in percent of a perfect unit pulse length.

DISTORTION, DELAY. (of a transmission system). That distortion caused by the difference between the maximum transit time and the minimum transit time of frequencies within a specified band. (Also called Time Delay Distortion and Phase Distortion.)

DISTORTION, END.(of start-stop teletypewriter signals). The shifting of the end of all marking pulses from their proper position in relation to the beginning of the start pulse.

DIVERSITY. That method of transmission an/or reception, whereby, in order to reduce the effects of fading, a single received information signal is derived from a combination of, or selection from a pluraltiy of signals containing the same information. Improvement gained shall be expressed in db.

DIVERSITY, DUAL. The term applied to the simultaneous combining of two signals and their detection through the use of space, frequency, or polarization characteristics.

DIVERSITY, FREQUENCY. Any method of transmission and reception wherein the same information signal is transmitted and received simultaneously on two or more distinct frequencies.

DIVERSITY, QUADRUPLE. The term applied to the simultaneous combining of four signals and their detection through the use of space, frequency, or combinations thereof.

DIVERSITY, SPACE. Any method of transmission and/or reception which employs antennas and having spatial separation.

DIVERSITY, INBAND. Synonymous with Frequency Diversity. A method of transmission and reception in which the bandpass is divided into a number of distinct and separate tones, wherein the same information signal is transmitted and received simultaneously on two or more of these distinct tones within this bandpass.

DIVERSITY, TONE. Synonymous with Frequency Diversity and Inband Diversity.

DIVERSITY, RF. That method which employs signals containing the same information which are simultaneously transmitted and/or received over two widely separated Radio Frequency carriers.

EQUALIZATION. The process of reducing frequency and/or phase distortion of a circuit by the introduction of networks to compensate for the difference in attenuation and/or time delay at the various frequencies in the transmission band.

FADING. The fluctuation in intensity of any or all frequency components of a received radio signal due to changes in the characteristics of the propagation path.

FADING, FLAT. The type of fading in which all frequency components of the received radio signal fluctuate in the same proportion simultaneously.

FADING, SELECTIVE. That type of fading in which the various frequency components of the received radio signal fluctuate independently.

SECTION 2

INSTALLATION

2-1. UNPACKING AND HANDLING.

Exercise caution when unpacking the equipment, to avoid damage to the fragile components; check for damage during shipment. Be sure that all of the printed-circuit cards are firmly seated in their connectors on the modules and that all of the modules are firmly seated in their connectors on the Cabinet.

2-2. SITE SELECTION AND INSTALLATION LAYOUT.

a. Telegraph Terminal AN/UCC-1D(V) is modular equipment. Thus, the number of units constituting an installation varies, depending upon the specific configuration involved. Pictorial diagrams showing typical configurations are shown in figures 2-1 through 2-5.

b. Telegraph Terminal units that can be independently mounted are the Cabinet, and the Test Set. Outline and mounting dimensions for these units are given in figures 2-6 and 2-7.

c. As indicated in figures 2-1 through 2-6, Cabinets may be mounted in standard 19-inch relay racks or stacked one on top of another. The Test Set can be either kept portable or bolted on top of the Cabinet.

d. To protect the semiconductor circuitry, do not install any Telegraph Terminal units above, below, or beside any equipment that radiates excessive heat.

e. Provide approximately two feet of space in front of the Cabinet, to facilitate removal of the modules.

2-3. INSTALLATION REQUIREMENTS.

a. GENERAL. - Because of the multiplicity of equipment configurations (see figures 2-1 through 2-5) obtainable with the Telegraph Terminal units, the following text outlines principles of design involved; a technician with an understanding of these general principles can set up the units in any desired configuration. (Connection and switch-setting information for several specific installation configurations is provided in b through j below.) Table 2-1 identifies Cabinet Connector functions; the connections made to them are determined by the configuration required.

(1) NON-DIVERSITY. - One basic configuration is four-channel non-diversity, involving four Keyers and four Converters in one Cabinet. Figure 2-8 reflects all connections involved as well as the switch settings required on the Control-Attenuator and the Keyers and Converters.

(a) The radio receiver may be connected to either PARALLEL TONES RCVR A or RCVR B terminals; however, the TONE INPUT switch on each Converter must be set to the same letter (A or B).

(b) The MODE switch in the Control-Attenuator must be set to MASTER on any Cabinet to which the parallel v-f link (radio receiver, demodulator, etc.) is connected.

(c) The d-c input and output loops for each Keyer or Converter are connected to the DC LOOPS connector terminals as indicated in figure 2-8 and Table 2-2.

(d) Notice, in figure 2-8, that the Keyers, and Converters may be inserted in any of the Cabinet positions except A9.

(e) This same basic configuration (non-diversity) may be expanded to any number of channels up to 16 (32 channels with a multiplexer-demultiplexer). For example, if 12 Keyers and 12 Converters are required, they may be inserted in any position of three Cabinets (however, unit types are usually grouped together). The Cabinet to which the parallel v-f links are connected is the master, while the other two Cabinets are slave. The two slave Cabinets are connected to the master Cabinet through the INTERCONNECT A or INTERCONNECT B connector, which extends the master RCVR A bus, RCVR B bus, XMIT bus, and ground to the associated buses of each slave Cabinet. The MODE switch of each slave Cabinet Control-Attenuator must be set to SLAVE to prevent loading of the buses with the slave Cabinet input and output transformers.

TABLE 2-1. CABINET CONNECTOR FUNCTIONS

CONNECTOR	REFERENCE DESIGNATION	FUNCTION
AC POWER IN	J1	Connects a-c power (115/230 volts, 50/60 Hz) to all units (through power switch and fuses on the Control-Attenuator).
AC POWER OUT	J2	Connects a-c power (115/230 volts, 50/60 Hz) for other Cabinets.
PARALLEL TONES XMIT	J3	Connects common send bus to radio transmitter (or Multiplexer) when MODE switch (on Control-Attenuator) is set to MASTER. Not used when MODE switch is set to SLAVE.
PARALLEL TONES RCVR/A AND RCVR/B	J4 and J5	Connects common receive A(B) bus to radio receiver output (or Demultiplexer output) when MODE switch (on Control-Attenuator) is set to MASTER. Not used when MODE switch is set to SLAVE.
INTERCONNECT A AND B	J6 and J7	Connects common receive A bus, receive B bus, transmit bus, and chassis ground of master Cabinet to the same buses of slave Cabinet.
DC LOOPS	J8	Connects d-c loops to the d-c input of Keyers or to d-c output of Converters. Refer to Table 2-2 for pin connections associated with each unit in the Cabinet.
INDIVIDUAL TONES	J9	Connects VF lines to individual v-f input of Converters or to individual v-f output of Keyers when the unit is set for INDIVIDUAL operation. Refer to Table 2-2 for pin connection associated with each unit in the Cabinet.

TABLE 2-2. DC LOOPS (J8) AND INDIVIDUAL TONES (J9) PINS ASSOCIATED WITH EACH UNIT IN CABINET

POSITION	KEYER LOOP INPUT (J8)	CONVERTER LOOP OUTPUT DC LOOPS (J8)*	KEYER INDIVIDUAL VF OUTPUT OR CONVERTER INDIVIDUAL VF INPUT INDIVIDUAL TONES (J9)
A1	A(+) B(-)	A(+) B(common) V(-)polar	A, B(ct), C
A2	C(+) D(-)	C(+) D(common) V(-)polar	D, E(ct), F
A3	E(+) F(-)	E(+) F(common) V(-)polar	G, H(ct), J
A4	G(+) H(-)	G(+) H(common) V(-)polar	K, L(ct), M
A5	J(+) K(-)	J(+) K(common) T(-)	N, P(ct), R
A6	L(+) M(-)	L(+) M(common) T(-)	S, T(ct), U
A7	N(+) P(-)	N(+) P(common) T(-)polar	V, W(ct), X
A8	R(+) S(-)	R(+) S(common) T(-)polar	Y, Z(ct), a

*For HI level (neutral) operation connections are made to: (+) and (common). For LO level (polar) operation connections are made to: (+) and (-) polar.

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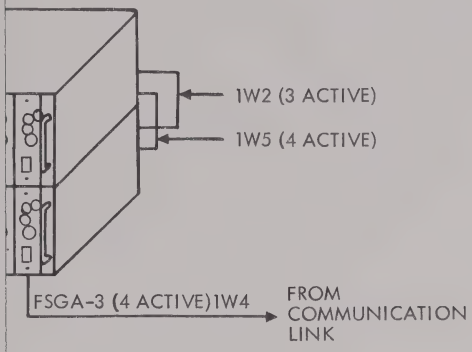
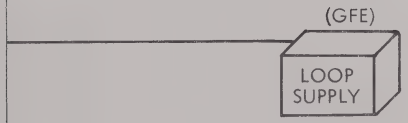
CAL EQUIPMENT
CY-4639A/UCC-1C(V)
16 FREQUENCY SHIFT
5 CV-1920A(P)/UCC-1C(V)





TELETYPEWRITER
PATCH BOARDS
(GFE)

NOTES:
1. VOLTAGE F
115V C
POWER REQ RECEIVING
KEYER, RMINALS OF 8
CONVI LETYPEWRITERS
CONTR
TEST SE
POWER FAC
2. CABLES 1W

Channel Frequency-Diversity
on, Pictorial Diagram

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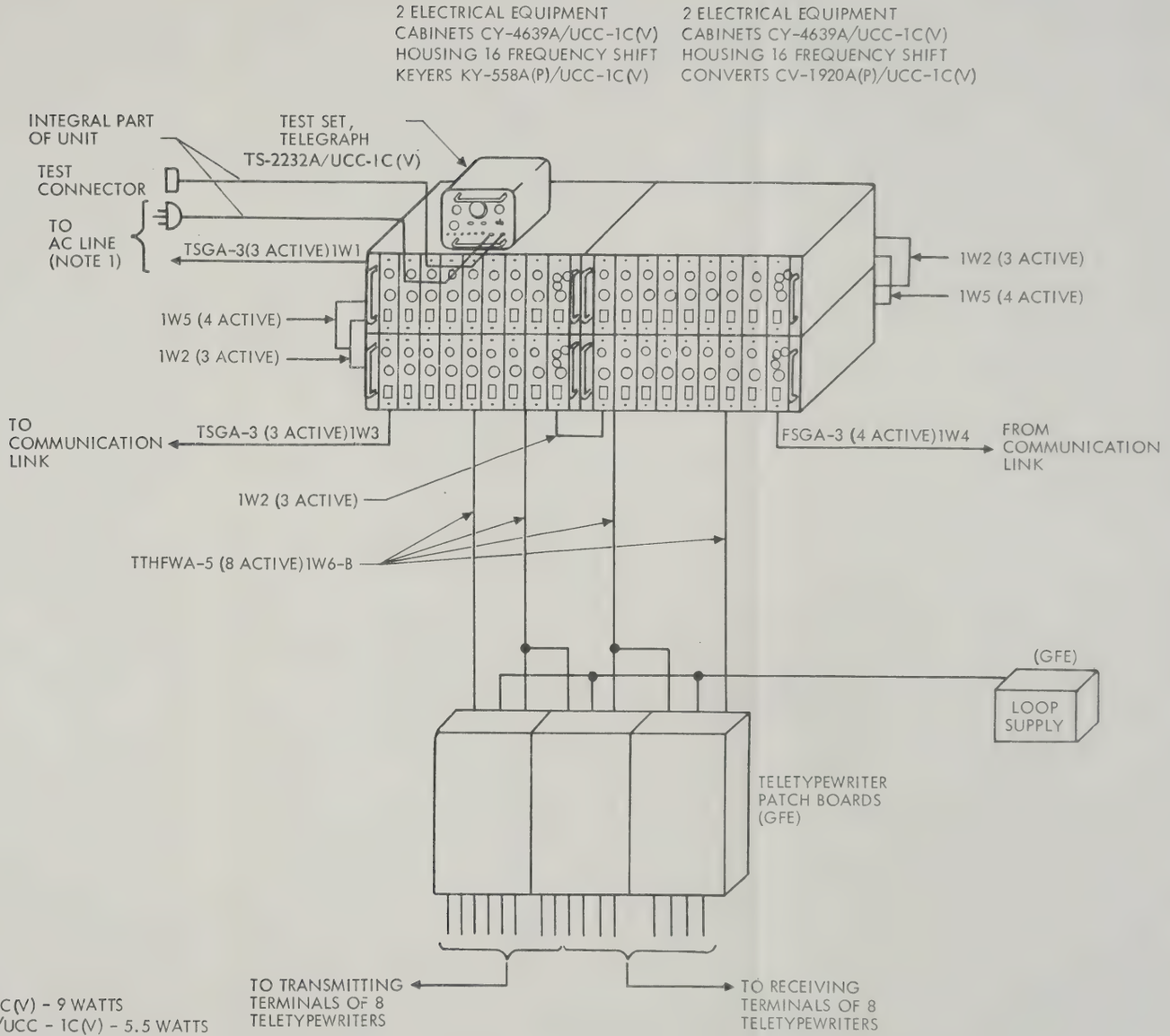
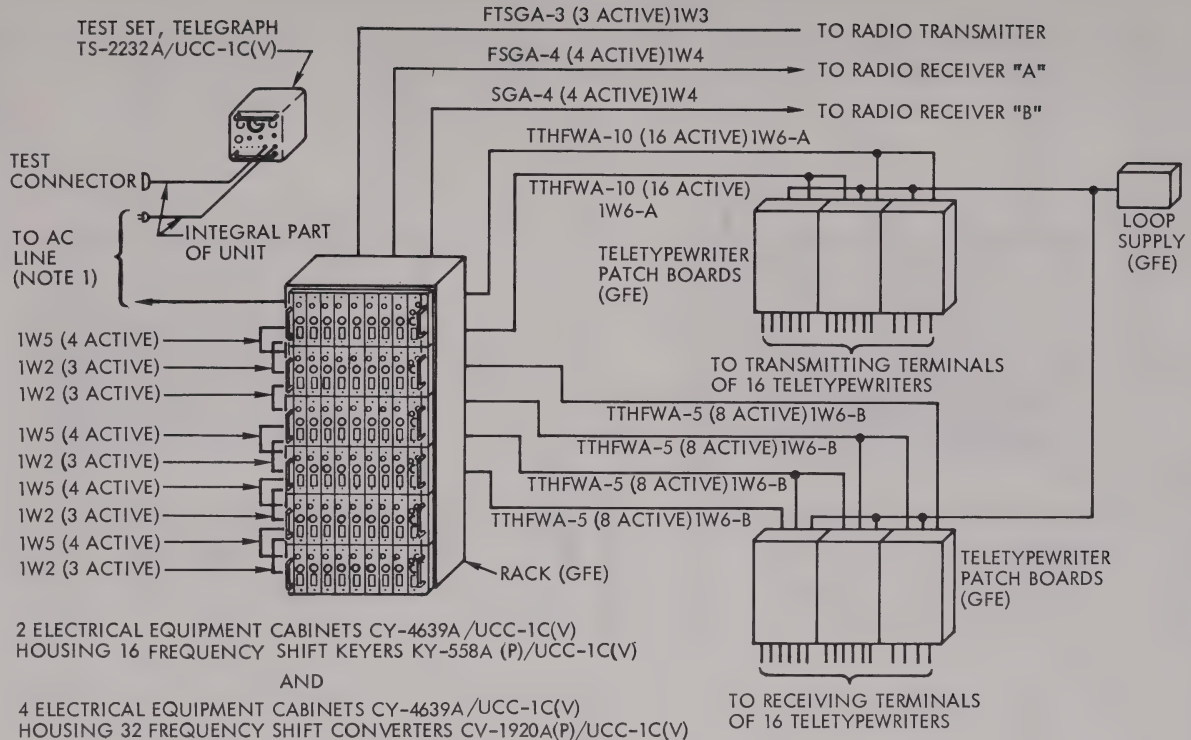

2 ELECTRICAL EQUIPMENT CABINETS CY-4639A/UCC-1C(V) HOUSING 16 FREQUENCY SHIFT KEYERS KY-558A(P)/UCC-1C(V)
2 ELECTRICAL EQUIPMENT CABINETS CY-4639A/UCC-1C(V) HOUSING 16 FREQUENCY SHIFT CONVERTS CV-1920A(P)/UCC-1C(V)
INTEGRAL PART OF UNIT
TEST SET, TELEGRAPH TS-2232A/UCC-1C(V)
TEST CONNECTOR
TO AC LINE (NOTE 1)
TSGA-3(3 ACTIVE)1W1
1W2 (3 ACTIVE)
1W5 (4 ACTIVE)
1W5 (4 ACTIVE)
1W2 (3 ACTIVE)
TO COMMUNICATION LINK
TSGA-3 (3 ACTIVE)1W3
FSGA-3 (4 ACTIVE)1W4
FROM COMMUNICATION LINK
1W2 (3 ACTIVE)
TTHFWA-5 (8 ACTIVE)1W6-B
(GFE)
LOOP SUPPLY
TELETYPEWRITER PATCH BOARDS (GFE)
TO TRANSMITTING TERMINALS OF 8 TELETYPEWRITERS
TO RECEIVING TERMINALS OF 8 TELETYPEWRITERS

NOTES:
1. VOLTAGE REQUIREMENTS;
   115V OR 230V ±10%, 1ϕ, 50 OR 60 Hz ±5%
   POWER REQUIREMENTS;
   KEYER, FREQUENCY SHIFT KY-558A(P)/UCC-1C(V) - 9 WATTS
   CONVERTER, FREQUENCY SHIFT CV-1920A(P)/UCC - 1C(V) - 5.5 WATTS
   CONTROL ATTENUATOR C6554A/UCC-1C(V) - 5 WATTS
   TEST SET, TELEGRAPH TS-2232A/UCC - 1C(V)
   POWER FACTOR - 1
2. CABLES 1W2 AND 1W5 ARE SUPPLIED.

Figure 2-1. Eight-Channel Frequency-Diversity Installation, Pictorial Diagram



NOTES:
1. VOLTAGE REQUIREMENTS:
   115V OR 230V ±10%, 1ϕ, 50 OR 60 Hz ±5%
   POWER REQUIREMENTS:
   KEYER, FREQUENCY SHIFT KY-558A(P)/UCC-1C(V) - 9 WATTS
   CONVERTER, FREQUENCY SHIFT CV-1920A(P)/UCC-1C(V) - 5.5 WATTS
   CONTROL ATTENUATOR, C-6554A/UCC-1C(V) - 5 WATTS
   TEST SET TELEGRAPH TS-2232A/UCC-1(V) - 10 WATTS
   POWER FACTOR - 1
2. CABLES 1W2, 1W5 ARE SUPPLIED.

Figure 2-2. Sixteen-Channel Space-Diversity Installation, Pictorial Diagram

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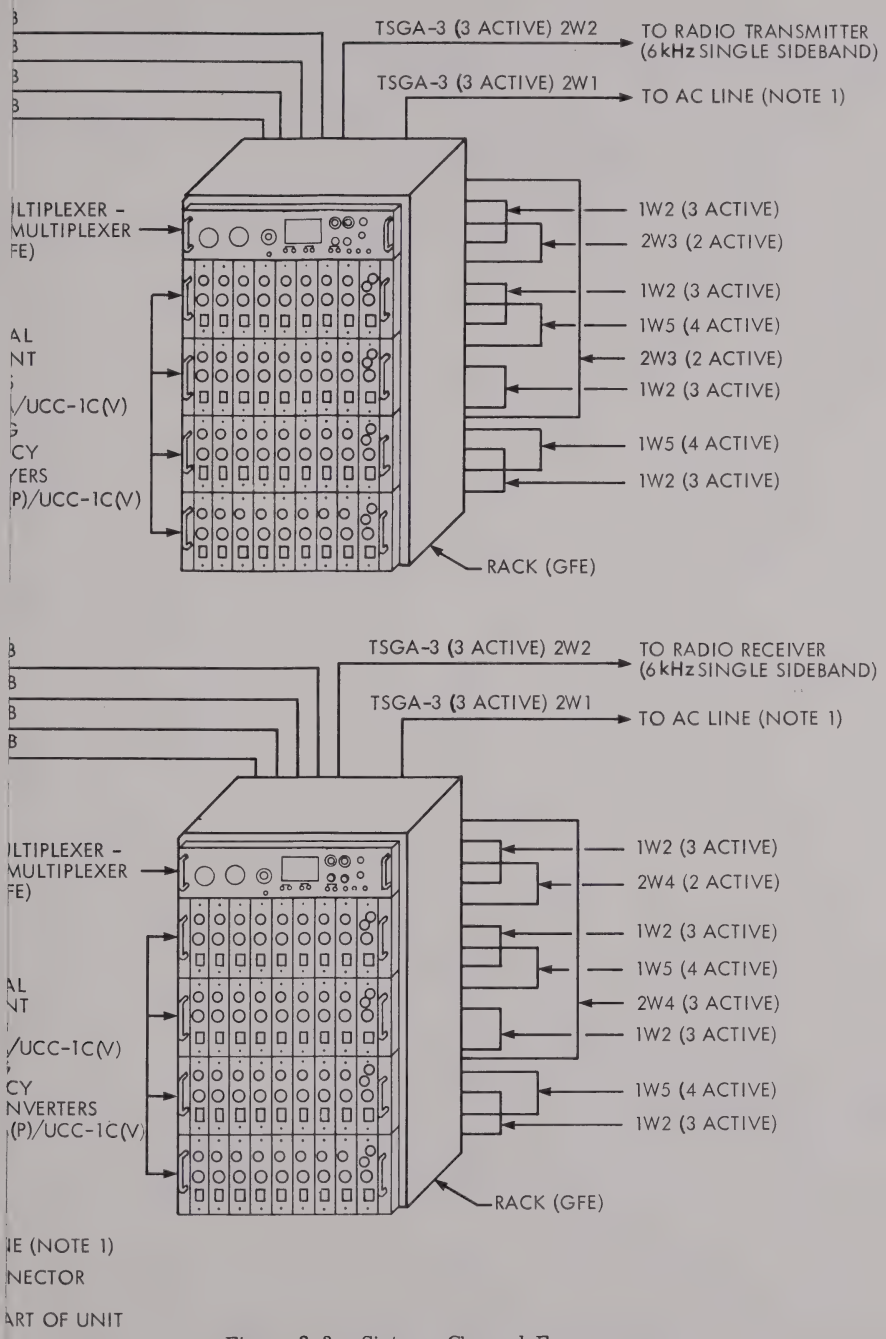

Figure 2-3. Sixteen-Channel Frequency-Diversity Installation, Pictorial Drawing

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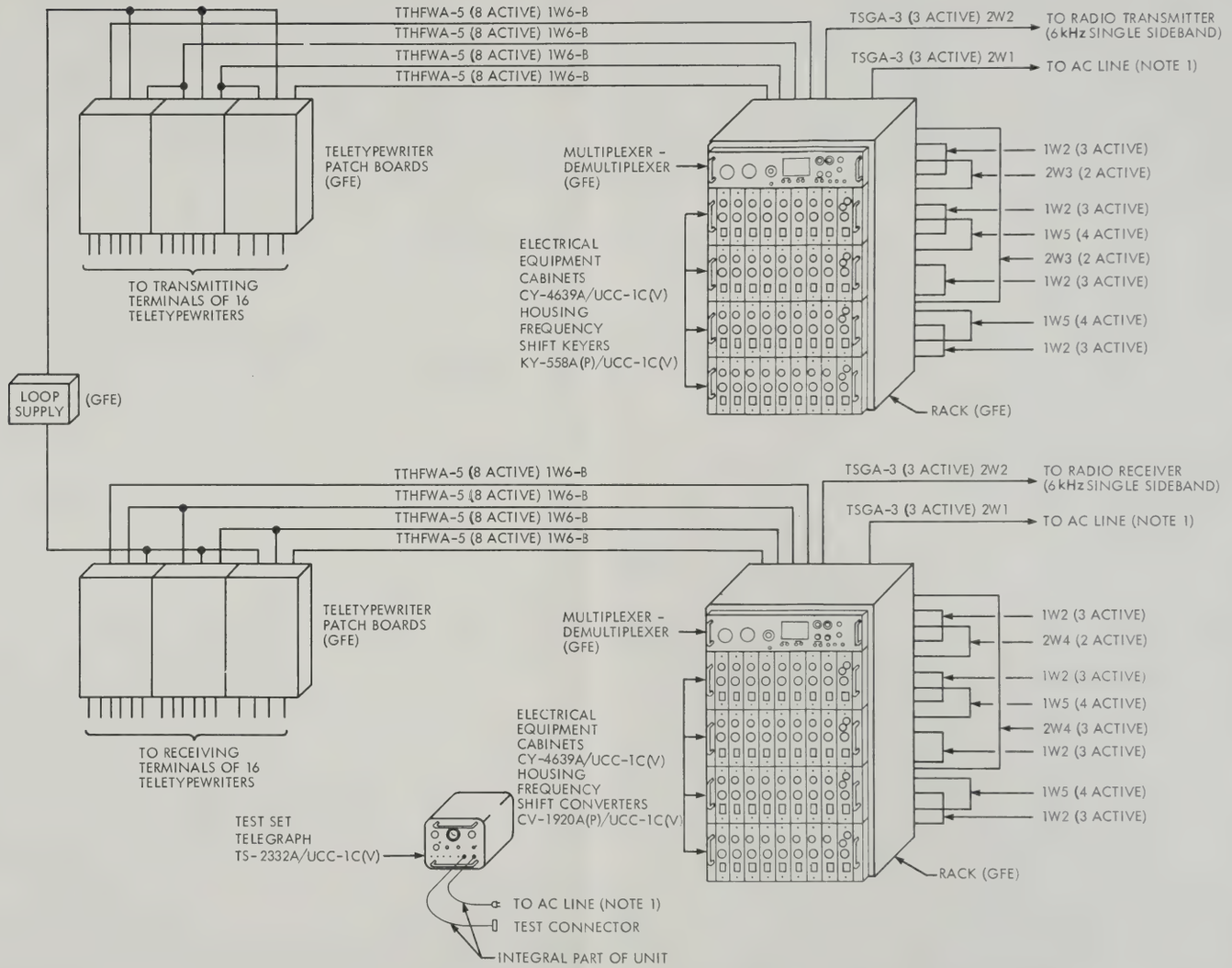
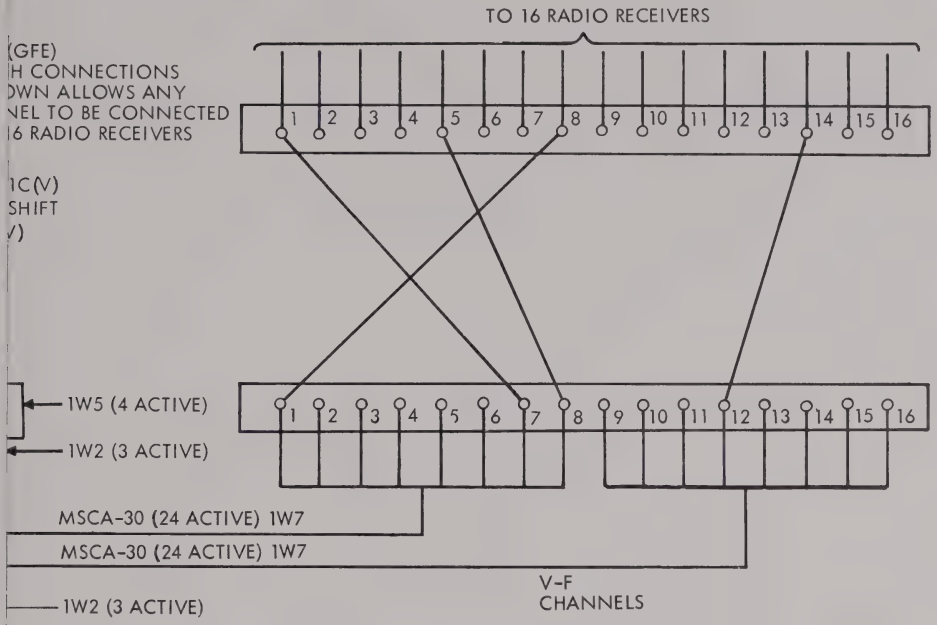
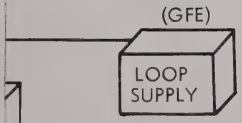


Figure 2-3. Sixteen-Channel Frequency-Diversity Installation, Pictorial Drawing

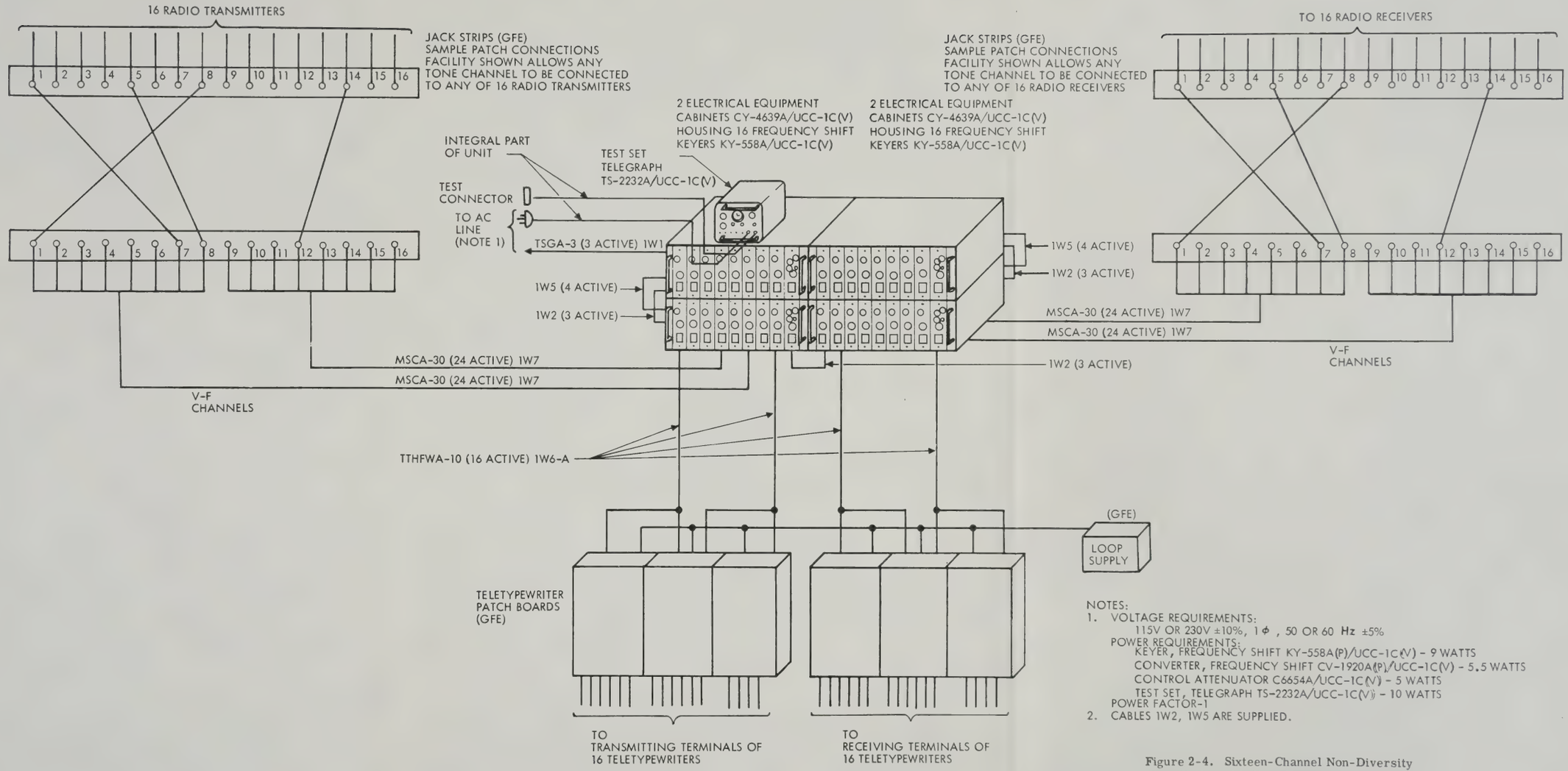
NOTES:
1. VOLTAGE REQUIREMENTS:
   115V OR 230V ±10%, 1 ϕ, 50 OR 60 Hz ±5%
   POWER REQUIREMENTS:
   KEYER, FREQUENCY SHIFT KY-558A(P)/UCC-1C(V) - 9 WATTS
   CONVERTER, FREQUENCY SHIFT CV-1920A(P)/UCC-1C(V) - 5.5 WATTS
   CONTROL ATTENUATOR C-6554A/UCC-1C(V) - 5 WATTS
   MULTIPLEXER-DEMULTIPLEXER TD-650/UCC-1(V) - 20 WATTS (GFE)
   TEST SET, TELEGRAPH TS-2232A/UCC-1C(V) - 10 WATTS
   POWER FACTOR - 1
2. CABLES 1W2, 1W5 ARE SUPPLIED.





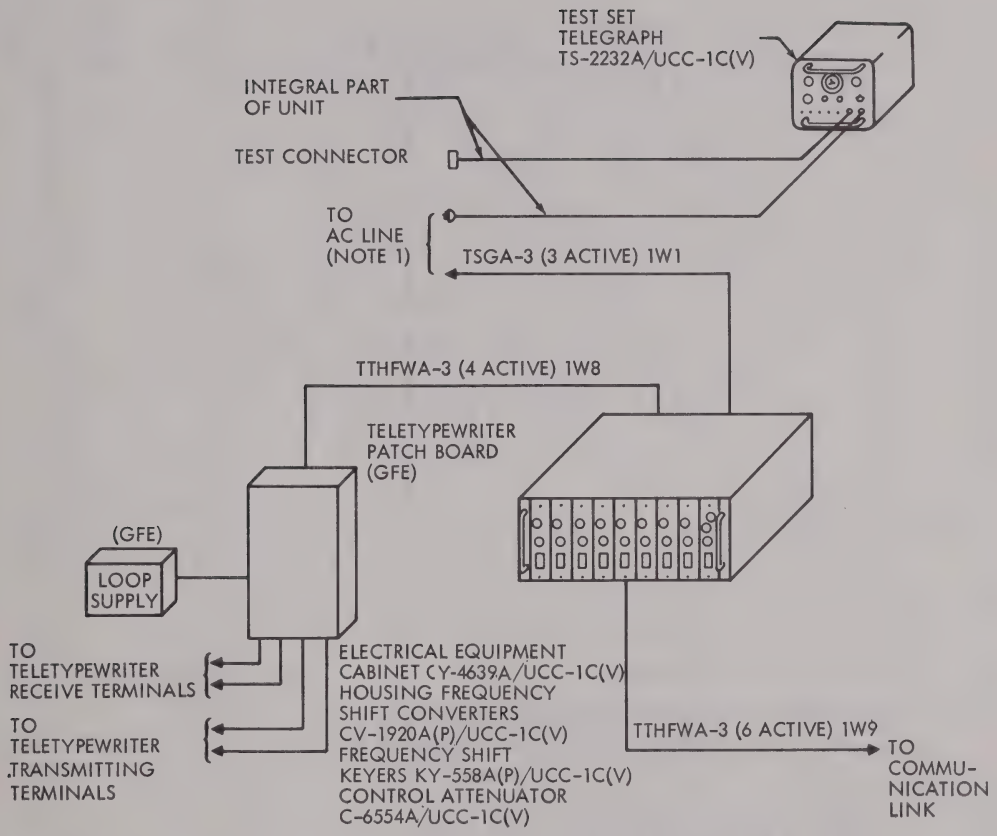
NOTES:
1. VOLTAGE REQUIREMENTS:
   115V OR 230V ±10%, 1 ϕ , 50 OR 60 Hz ±5%
   POWER REQUIREMENTS:
   KEYER, FREQUENCY SHIFT KY-558A(P)/UCC-1C(V) - 9 WATTS
   CONVERTER, FREQUENCY SHIFT CV-1920A(P)/UCC-1C(V) - 5.5 WATTS
   CONTROL ATTENUATOR C6654A/UCC-1C(V) - 5 WATTS
   TEST SET, TELEGRAPH TS-2232A/UCC-1C(V) - 10 WATTS
   POWER FACTOR-1
2. CABLES 1W2, 1W5 ARE SUPPLIED.

Figure 2-4. Sixteen-Channel Non-Diversity Installation with Tone Patching Facility, Pictorial Diagram



NOTES:
1. VOLTAGE REQUIREMENTS:
   115V OR 230V ±10%, 1 ϕ , 50 OR 60 Hz ±5%
   POWER REQUIREMENTS:
   KEYER, FREQUENCY SHIFT KY-558A(P)/UCC-1C(V) - 9 WATTS
   CONVERTER, FREQUENCY SHIFT CV-1920A(P)/UCC-1C(V) - 5.5 WATTS
   CONTROL ATTENUATOR C6654A/UCC-1C(V) - 5 WATTS
   TEST SET, TELEGRAPH TS-2232A/UCC-1C(V) - 10 WATTS
   POWER FACTOR-1
2. CABLES 1W2, 1W5 ARE SUPPLIED.

Figure 2-4. Sixteen-Channel Non-Diversity Installation with Tone Patching Facility, Pictorial Diagram



NOTES:
1. VOLTAGE REQUIREMENTS:
   115V OR 230V ±10%, 1 ϕ 50 OR 60 Hz ±5%
   POWER REQUIREMENTS:
   KEYER, FREQUENCY SHIFT KY-558A(P)/UCC-1C(V)-9 WATTS
   CONVERTER, FREQUENCY SHIFT CV-1920A(P)/UCC-1C(V)-5.5 WATTS
   CONTROL ATTENUATOR C-6554A/UCC-1C(V)-5 WATTS
   TEST SET, TELEGRAPH TS-2232A/UCC-1C(V)-10 WATTS
   POWER FACTOR-1

Figure 2-5. One-Channel Frequency-Diversity Installation, Pictorial Diagram

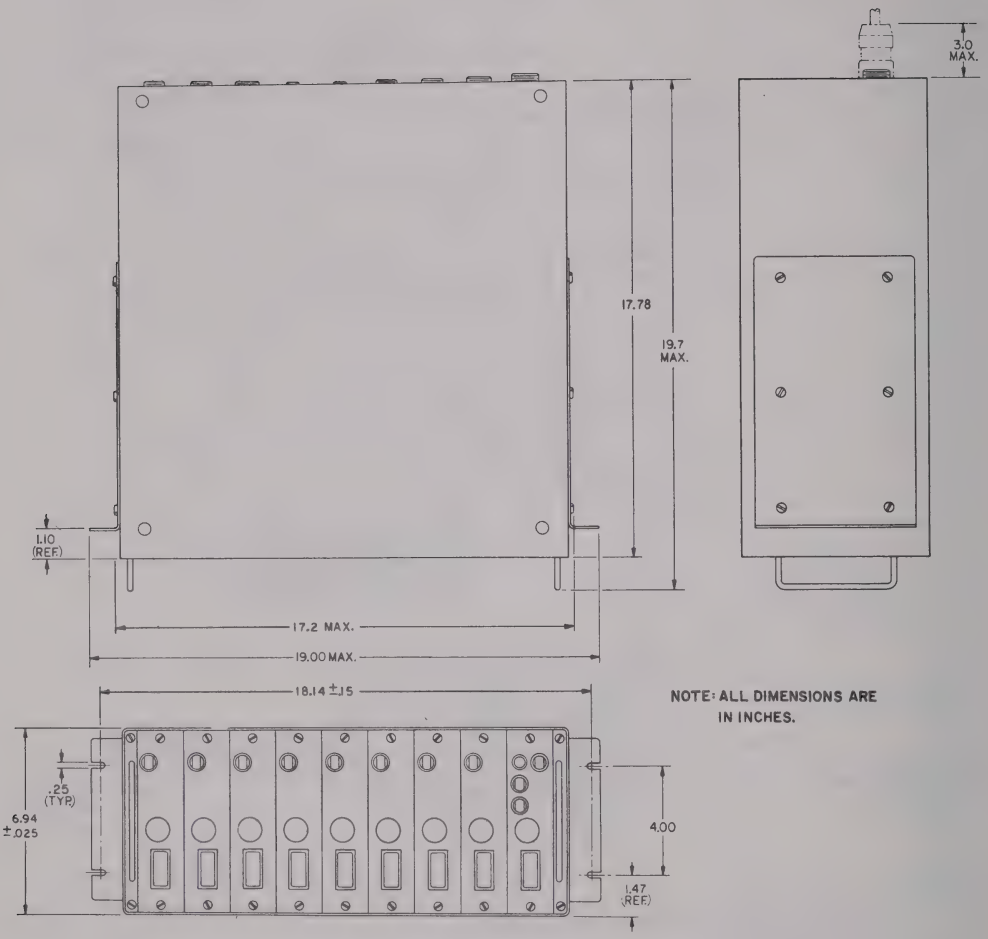


Figure 2-6. Cabinet, Electrical Equipment CY-4639A/UCC-1C(V), Outline Drawing

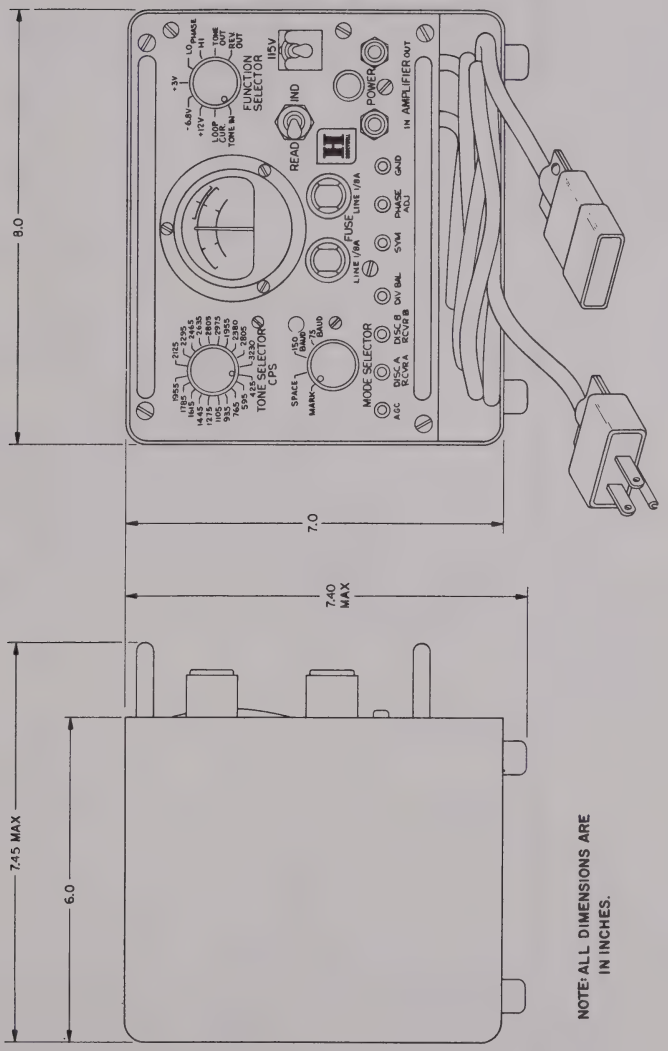


Figure 2-7. Test Set, TS-2232 A/UCC-1C(V), Outline Drawing

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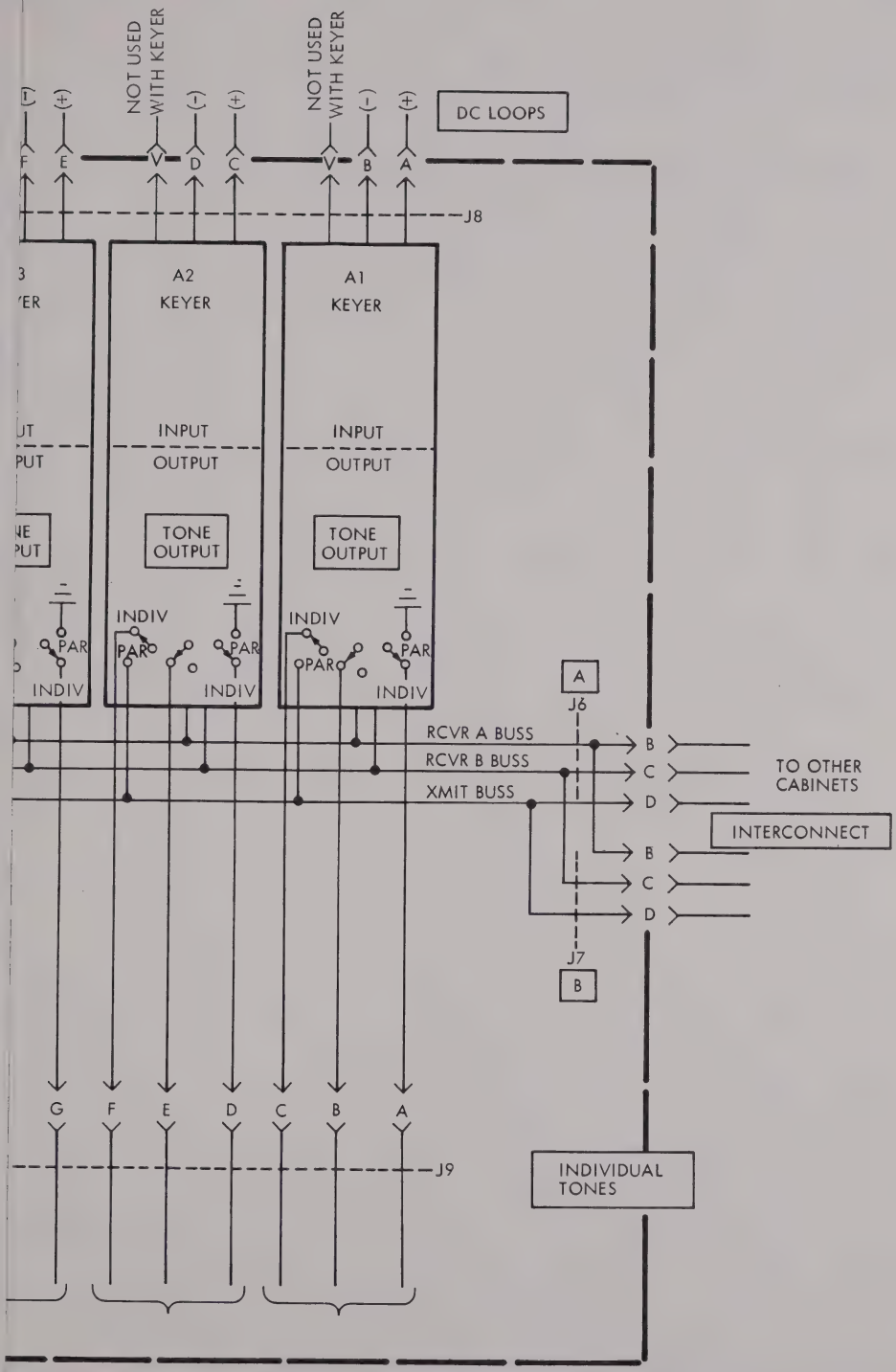

Figure 2-8. Functional Breakdown of Cabinet

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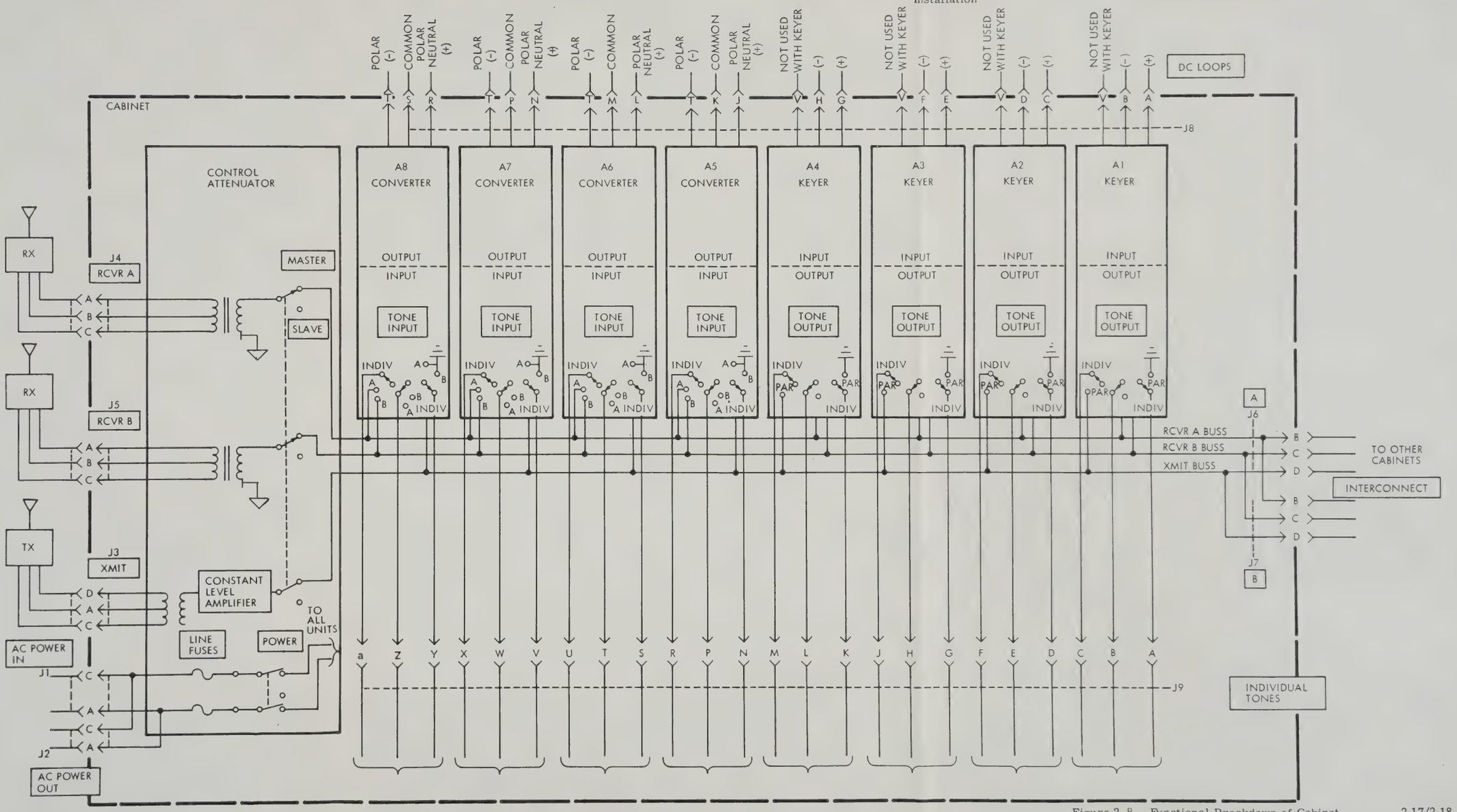


Figure 2-8. Functional Breakdown of Cabinet

(f) A 16-channel non-diversity configuration may follow the same pattern as the 12-channel system with one additional Cabinet, or it may be set up with one master and one slave Converter Cabinet, and one master and one slave Keyer Cabinet. In the latter configuration:

1 Interconnection is required between the Converter master and slave Cabinets and between the Keyer master and slave Cabinets.

2 Radio receiver output is connected to PARALLEL TONES RCVR A or RCVR B jack of the master Converter Cabinet, and the radio transmitter input is connected to the master Keyer Cabinet PARALLEL TONES XMIT jack. (There is no interconnection between the Keyer and Converter Cabinets.)

(2) DIVERSITY. - Cabinet interconnection for diversity operation follows the same principles as for non-diversity, except for the following considerations.

(a) TWO-DIVERSITY.

1 A two-diversity pair consists of units in position A1 and A2, A3 and A4, A5 and A6, or A7 and A8. No other pair of positions will operate as a two-diversity pair.

2 The DC LOOP connection to a two-diversity pair is at DC LOOP jack pins associated with positions A1, A3, A5, or A7.

3 The Keyer DIVERSITY switch must be set to TWO.

4 The Keyer TONE output switch must be set to PARALLEL.

5 The Converter DIVERSITY switch must be set to TWO.

6 The Converter TONE input switch must be set to RCVR A or RCVR B.

(b) FOUR-DIVERSITY.

1 A four-diversity set consists of Converters in positions A1, A2, A3, and A4, or in positions A5, A6, A7, and A8. No other combination of positions may be used as a four-diversity set.

2 The d-c loop connection to a four-diversity set is at the DC LOOP jack pins associated with position A1 or A5.

3 The Converter DIVERSITY switch must be set to FOUR.

4 The Keyer DIVERSITY switch must be set to FOUR.

(3) INDIVIDUAL. - Any position (A1 through A8) of a Cabinet may be used for an INDIVIDUAL channel, regardless of how the other Cabinet units are used. The only differences for this mode operation are:

(a) On a Converter, the TONE INPUT switch must be set to INDIV.

(b) On a Converter, the DIVERSITY switch must be set to ONE.

(c) On a Keyer, the TONE OUTPUT switch must be set to INDIVIDUAL.

(d) On a Keyer, the DIVERSITY switch must be set to ONE.

(e) The tone input or output is connected to the INDIVIDUAL jack pins as indicated in Table 2-2 and in figure 2-8.

b. CONNECTOR LOCATION. - All connections to Telegraph Terminal units are made on the rear of the units. Figure 2-9 shows the rear connectors of the Cabinet.

c. CABLES. - Tables 2-3 and 2-4 describe the cables required for Telegraph Terminal installation.

d. TYPICAL CONFIGURATION CONNECTIONS. - Typical configuration connection diagrams are shown in the figures indicated below.

(1) Figure 2-10 represents an eight-individual-channel non-diversity connection diagram

(2) Figure 2-11 represents a 16-channel non-diversity connection diagram

(3) Figure 2-12 represents a 16-channel space-diversity connection diagram

(4) Figure 2-13 represents a 16-channel (32 tones) frequency-diversity connection diagram.

(5) Figure 2-14 represents a one-channel (2 tones) frequency-diversity connection diagram.

e. A-C POWER OPTIONS. - The Telegraph Terminal can be arranged for operation on either a 115- or 230-volt, 50- to 60-Hz power source. Before connecting the equipment to a power source, proceed as described below.

(1) Determine whether the power source is 115 or 230 volts.

(2) Check the position of the POWER-switch locking guard on the front panel of the Control-Attenuator (figure 3-1), and Test Set (figure 3-4).

(a) For 115-volt operation, the locking guard must be positioned so that the switch can be operated only to its off or 115V positions.

TABLE 2-3. CABLES NOT SUPPLIED BY MANUFACTURER

SYMBOL	NUMBER COND	ACTIVE COND	TYPE NUMBER	FROM	TO	PLUG
1W1	3	3	TSGA-3	Cabinet	A-C Line	3-Wire A-C Plug and MS3116E-12-3S
1W3	3	3	TSGA-3	Cabinet	Communication Link	MS3116E-14-5S
1W4	4	4	TSGA-3	Cabinet	Communication Link	MS3116E-8-4S
1W6-A[1]	20	16	TTHFWA-10			
1W6-B[2]	10	8	TTHFWA-5	Cabinet	Teletypewriter Patchboard	MS3116E-14-19S
1W6-C[3]	6	4	TTHFWA-3			
1W7	30	24	MSCA-30	Cabinet	Audio Patchboard	MS3116E-16-26S
1W8[2]	6	4	TTHFWA-3	Cabinet	Teletypewriter Patchboard	MS3116E-14-19S
1W9	6	6	TTHFWA-3	Cabinet	Communication Link	MS3116E-16-26S
1W10	3	3	TSGA-3	Test Adapter	A-C Line	3-Wire A-C Plug

[1] Non-Diversity [2] Two-Channel Diversity [3] Four-Channel Diversity

TABLE 2-4. CABLES SUPPLIED BY MANUFACTURER

SYMBOL	NUMBER COND	ACTIVE COND	FROM	PURPOSE	PLUGS
1W2 (POWER)	3	3	Cabinet Cabinet	A-C Power Interconnect	MS3116F-12-3P MS3116F-12-3S
1W5 (TONE)	4	4	Cabinet Cabinet	Signal Interconnect	MS3116F-12-10S MS3116F-12-10S

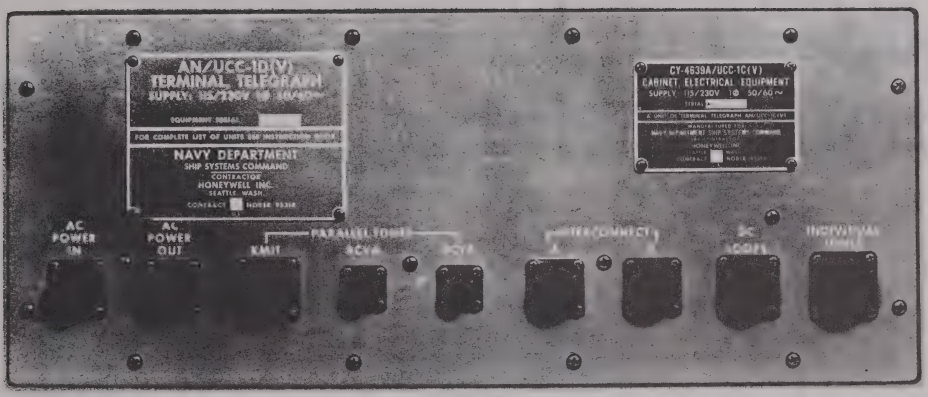


Figure 2-9. Cabinet, Rear View

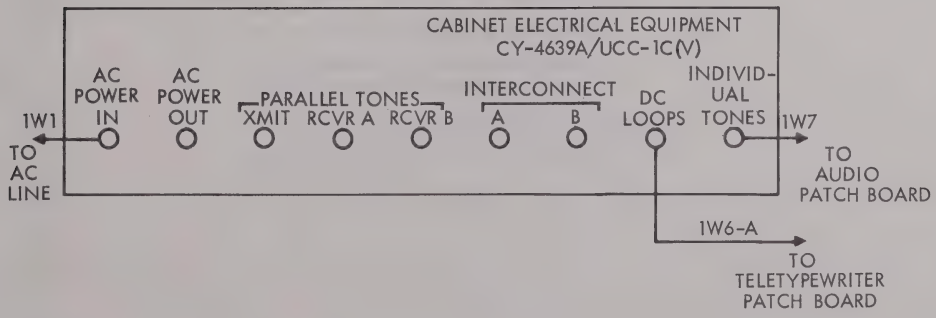
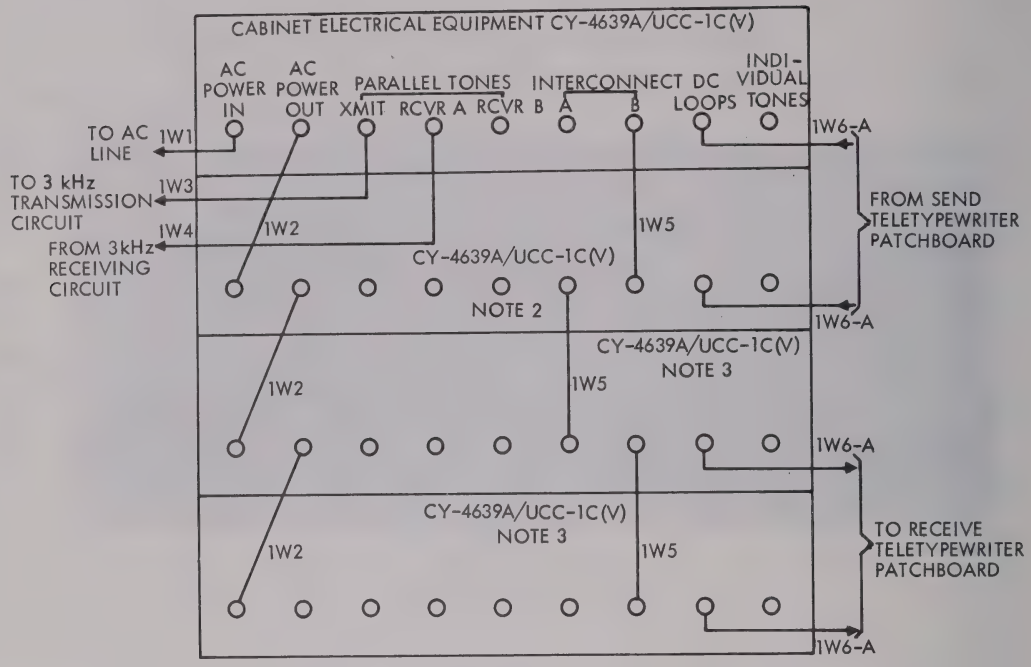


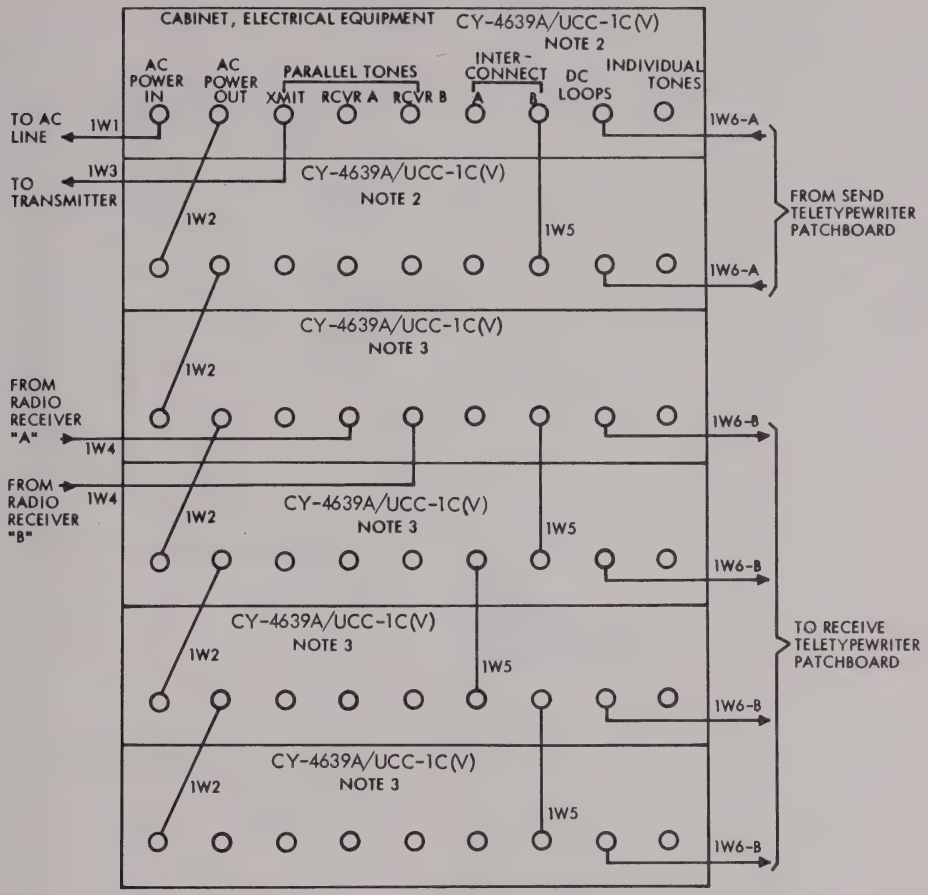
Figure 2-10. Eight-Channel Non-Diversity Connection Diagram



NOTES:

1. ALL UNITS ARE LABELED IDENTICALLY
2. TOP 2 CABINETS HOUSE 16 FREQUENCY SHIFT KEYERS, KY-558A(P)/UCC-1C(V)
3. BOTTOM 2 CABINETS HOUSE 16 FREQUENCY SHIFT CONVERTERS, CV-1920A(P)/UCC-1C(V)

Figure 2-11. Sixteen-Channel Non-Diversity Connection Diagram



NOTES:

1. ALL UNITS ARE LABELED IDENTICALLY
2. TOP 2 CABINTET HAVE 16 FREQUENCY SHIFT KEYERS, KY-558A(P)/UCC-1C(V)
3. BOTTOM 4 CABINETS HOUSE 16 FREQUENCY SHIFT CONVERTERS, CV-1920A(P)/UCC-1C(V) 2 PER CHANNEL

Figure 2-12. Sixteen-Channel Space-Diversity Connection Diagram

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R

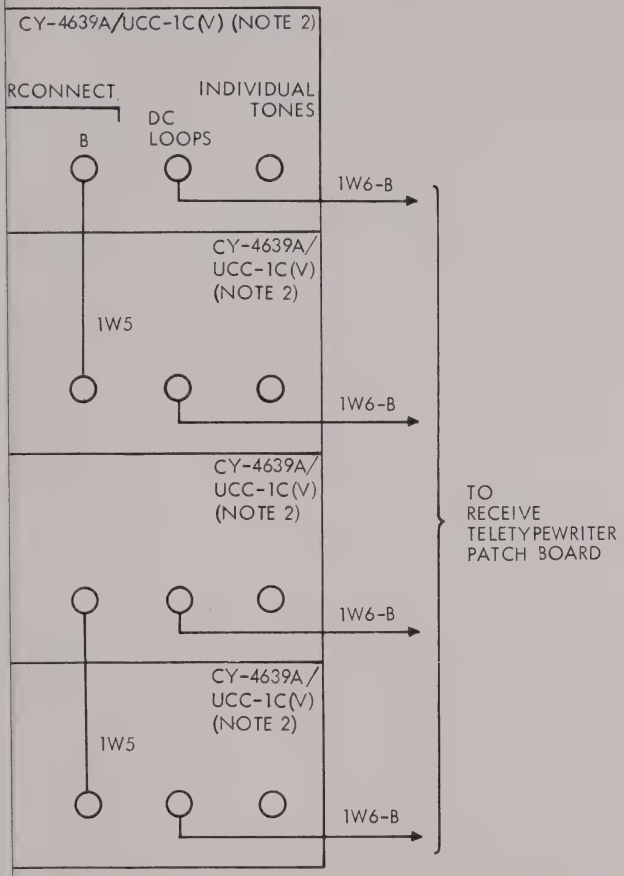

Figure 2-13. Sixteen-Channel (32 Tones) Frequency-Diversity Connection Diagram

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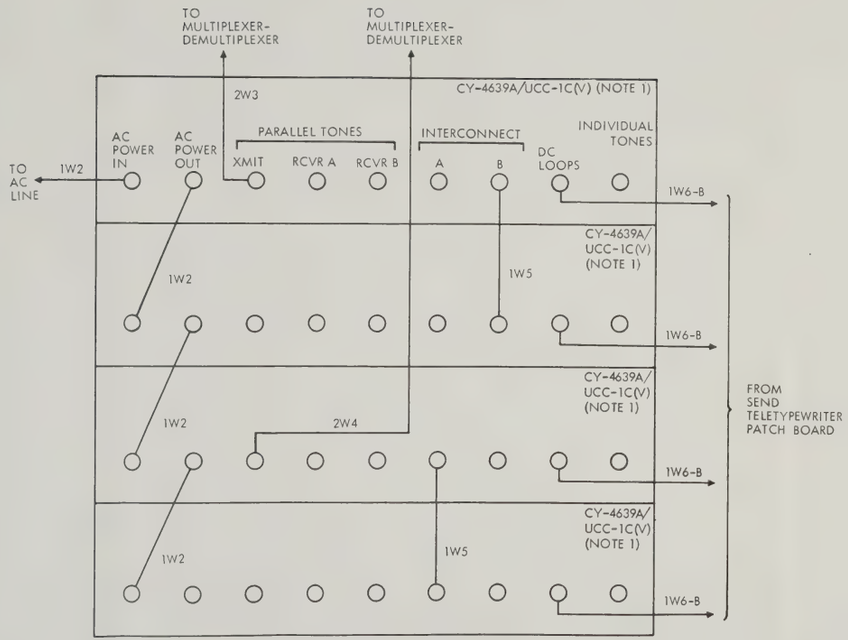


NOTES:

1. FOUR ASSOCIATED ELECTRICAL EQUIPMENT CABINETS CY-4639A/UCC-1C(V) HOUSE 32 FREQUENCY SHIFT KEYERS KY-558A(P)/UCC-1C(V). EACH PAIR OF CABINETS (INTERCONNECTED BY CABLE 1W5) HOUSE 8 FREQUENCY DIVERSITY PAIRS OF KEYERS.
2. FOUR ASSOCIATED ELECTRICAL EQUIPMENT CABINETS CY-4639A/UCC-1C(V) HOUSE 32 FREQUENCY SHIFT CONVERTERS CV-1920A(P)/UCC-1C(V). EACH PAIR OF CABINETS (INTERCONNECTED BY CABLE 1W5) HOUSE 8 FREQUENCY DIVERSITY PAIRS OF CONVERTERS
3. ALL ELECTRICAL EQUIPMENT CABINETS CY-4639A/UCC-1C(V) ARE LABELED IDENTICALLY.

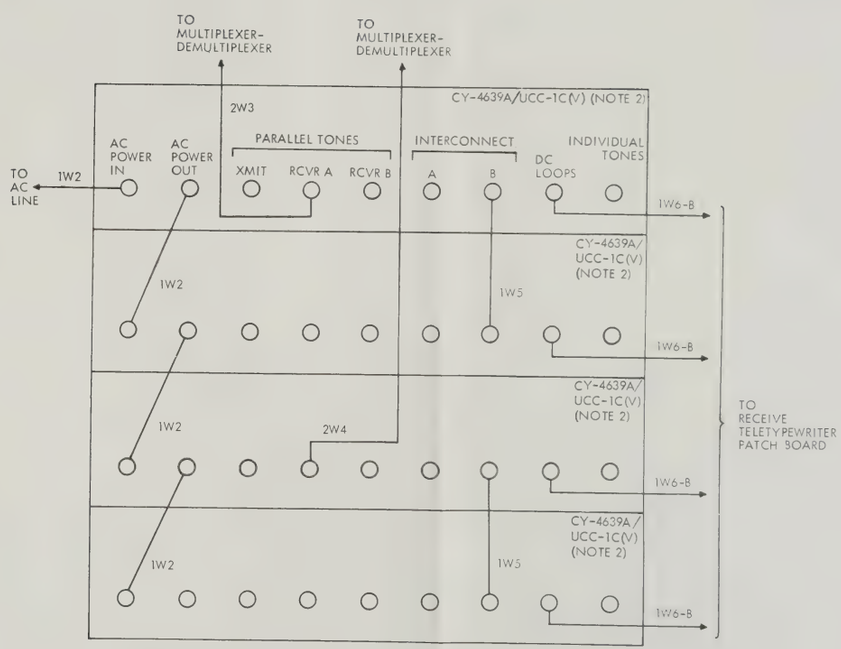


Figure 2-13. Sixteen-Channel (32 Tones) Frequency-Diversity Connection Diagram

Figure 2-14. One-Channel Frequency-Diversity Connection Diagram

(b) For 230-volt operation, the locking guard must be positioned so that the switch can be operated only to its off or 230V positions.

(3) The equipment as supplied by the manufacturer is connected for operation on 115V. If 230V is to be used as a power source, the Cabinet wiring must be modified as follows:

(a) Remove the 10 screws holding the rear cover to the Cabinet.

(b) On connectors XA1-XA9, pin RR is connected by a bus wire to pin SS. Remove this jumper.

(c) Connect pin RR to pin PP on Connectors XA1-XA9 using a short length of 22 or 24 ga. bus wire. Solder both ends securely and check to insure that the wire(s) do not short to any adjacent pin, to the Cabinet, or to pin SS.

(d) Replace the back cover and install the 10 retaining screws.

(4) Reposition the POWER-switch locking guard as required by the source voltage, as follows:

(a) Operate the switch to the off (center) position.

(b) Loosen the locking-guard nut.

(c) Turn the locking guard as required; see (2) above.

(d) Tighten the locking-guard nut.

f. A-C POWER CONNECTIONS.

(1) Set all POWER switches to the off position.

(2) Interconnect all units by means of a-c power interconnect cables 1W2 (see figures 2-11 through 2-14).

(3) Connect cable 1W1 from the A-C POWER IN jack to a source of 115/230-volt a-c power, as specified in e, above.

g. D-C LOOP CONNECTION. - For each Cabinet used, connect cable 1W6 from DC LOOPS jack to external signal loop connectors or teletypewriter patchboard.

Note

For minimum r-f interference connect the negative side of the DC loop power supply to ground. The loop current rheostat must be connected in the positive leg of the external d-c loop power supply.

h. CABINET INTERCONNECTIONS. - Where outputs from more than one Cabinet are placed on a common line or where inputs to more than one Cabinet are received on a common input line, use cables 1W5 to interconnect Cabinets. Make connections between INTERCONNECT A or INTERCONNECT B jacks (note that these jacks on each Cabinet are in parallel; (see figure 2-8).

i. PARALLEL TRANSMIT AND RECEIVE CONNECTIONS. - For a system that:

(1) Does not include a multiplexer-demultiplexer:

(a) Connect cable 1W3 from PARALLEL TONES XMIT jack as required by system configuration.

(b) Connect 1W4 cables from PARALLEL TONES RCVR A or RCVR B jacks as required by system configuration.

(2) Includes a multiplexer-demultiplexer:

(a) Connect 2W3 cables between PARALLEL TONES XMIT jacks (Cabinet) and DIRECT PATH and TRANSLATED PATH jacks of the multiplexer-demultiplexer used as a multiplexer (see figure 2-13).

(b) Connect cable 2W2 from COMPOSITE SIGNAL jack on the multiplexer-demultiplexer used as a multiplexer, to six-kHz bandwidth radio transmitter.

(c) Connect 2W4 cables between PARALLEL TONES RCVR A and RCVR B jacks (Cabinet) and DIRECT PATH and TRANSLATED PATH jacks of the multiplexer-demultiplexer used as a demultiplexer (see figure 2-13).

(d) Connect cable 2W2 from COMPOSITE SIGNAL jack on the multiplexer-demultiplexer used as a demultiplexer to six-kHz bandwidth radio receiver.

j. INDIVIDUAL CONNECTIONS. - For every Cabinet where voice-frequency channel outputs are required on individual output lines or voice-frequency channel inputs are required from individual input lines, connect cable 1W7 from INDIVIDUAL TONES jack to the appropriate equipment.

2-4. INITIAL SWITCH SETTINGS AND ADJUSTMENTS.

Table 2-5 identifies test equipment required to make the initial adjustments of the Telegraph Terminal. Perform the following procedure in order.

a. CONTROL-ATTENUATOR (see figure 2-15). -

(1) Withdraw the Control-Attenuator from each Cabinet.

(2) If an external connection is being made to the PARALLEL TONES XMIT jack or to the PARALLEL TONES RCVR A or RCVR B jacks of the cabinet, set the MODE switch to MASTER: if no connection is being made to these jacks, set the MODE switch to SLAVE.

(3) Replace the Control-Attenuator in the Cabinet.

b. KEYER (see figure 2-16). -

(1) Withdraw each Keyer from the Cabinet and perform the following steps:

(a) On the printed-circuit card, position the shorting loop between the black jack (common) and either the green jack (LO) or the red jack (HI) depending on the method of keying to be used. LO is used for polar keying and HI is used for neutral keying.

(b) If the Keyer is to be used individually (non-diversity), set the TONE OUTPUT switch to INDIVIDUAL. If the Keyer is to be used in a frequency-diversity combination, set the TONE OUTPUT switch to PARALLEL.

(c) For a system in which space frequencies are lower than the channel center frequencies, set the SIGNAL SENSE switch to NORMAL. For a system in which space frequencies are higher than the channel center frequencies, set the SIGNAL SENSE switch to REVERSE.

(d) Set the DIVERSITY switch as follows:

1 For non-diversity operation, set the switch to ONE.

2 For use in a diversity pair, set the switch to TWO.

3 For use in four-channel diversity, set the switch to FOUR.

(e) Set the tone switch to OFF

(f) Replace all Keyers in the Cabinet.

(2) If neutral, (HI) keying is used; use Test Set, Telegraph TS-2232A/UCC-1C(V) to monitor loop current and adjust the d-c current of each input loop as follows:

(a) Plug the test cable of the Test Set into the TEST connector of one of the Keyers in the loop.

(b) Set the FUNCTION SELECTOR switch on the Test Set to LOOP CURRENT.

(c) Set the external loop in a steady mark (loop current flows) condition.

(d) Adjust the resistance of the external signal loop to obtain an indication of 60 ma or 20 ma, depending on the loop power supply, on the Test Set meter.

(e) Set the FUNCTION SELECTOR switch on the Test Set to TONE IN.

(f) Plug the test cable of the Test Set into the TEST connector of one of the Keyers.

(g) Set the Keyer Tone ON/OFF switch to ON and adjust the Tone Level control to obtain a reading of 0 (zero) dbm on the Test Set meter. Set the Tone switch to OFF. Repeat this procedure for each of the remaining Keyers.

(h) Set the Tone ON/OFF switch on all Keyers to ON.

TABLE 2-5. TEST EQUIPMENT REQUIRED FOR INITIAL ADJUSTMENT

NOMENCLATURE		
NAME	DISIGNATION	COMMON NAME
Oscilloscope	AN/USM - 117 ( )	Oscilloscope
Test Set, Telegraph	TS 2232 A/UCC - 1C (V)	Test Set
Electronic Multimeter	ME - 6 ( )/U	ME - 6
Multimeter	AN/PSM - 4 ( )	Multimeter
Audio Oscillator	AN/URM - 127 ( )	Audio Oscillator

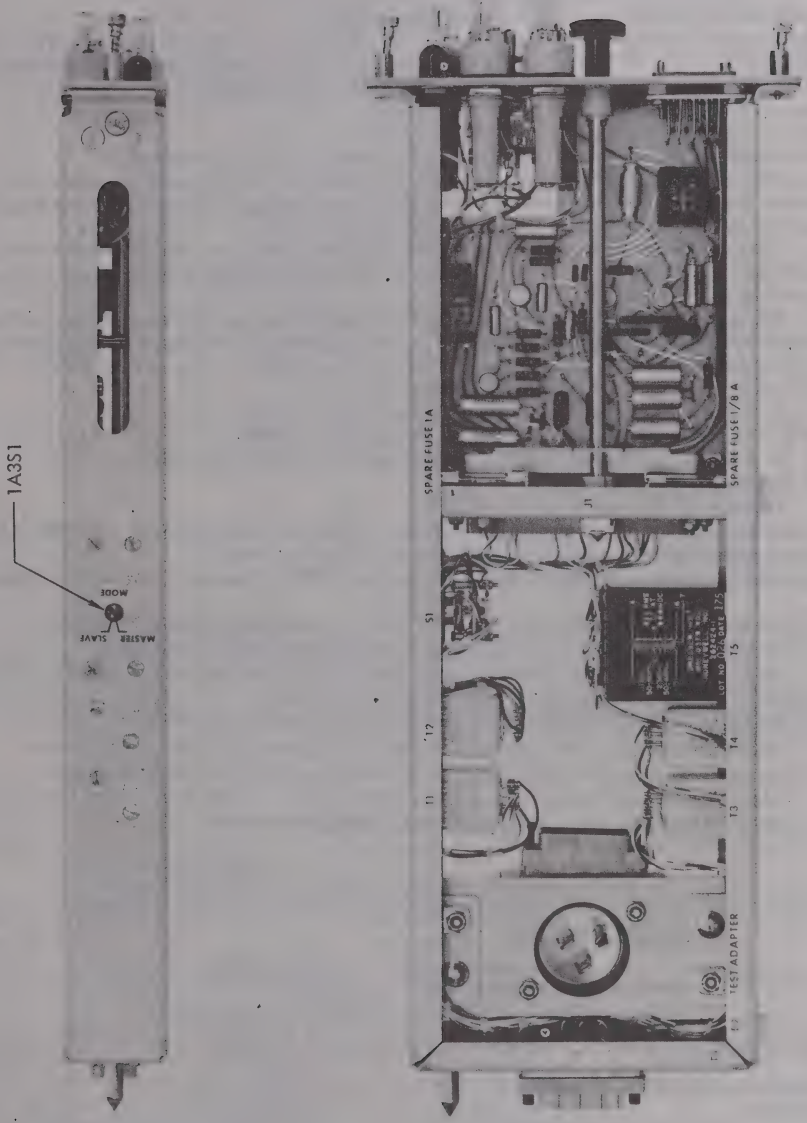


Figure 2-15. Control-Attenuator C-6554A/UCC-1C(V), Top and Left Side Views

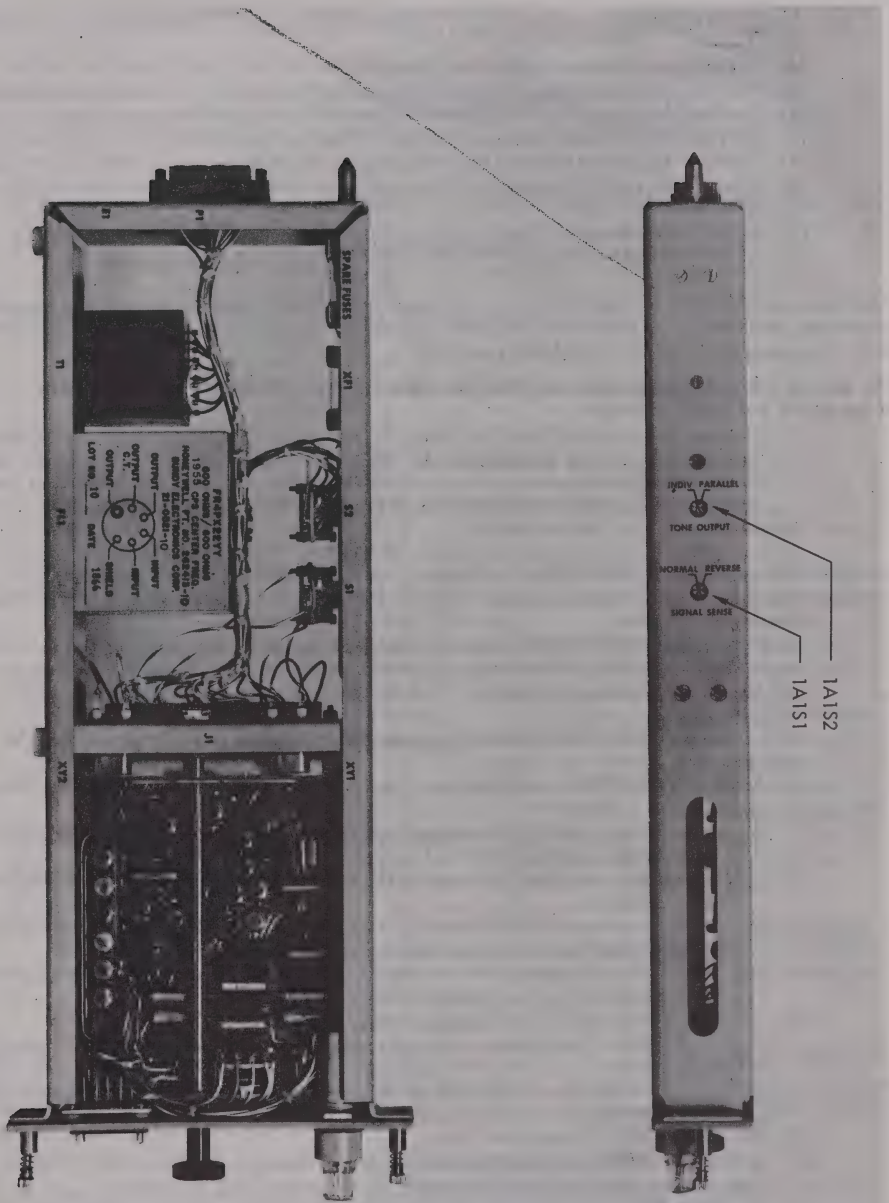


Figure 2-16. Keyer, Frequency Shift KY558A/UCC-1C(V), Top and Left Side Views

(3) Adjust the BIAS control on each Keyer, whether it is used in a diversity group or non-diversity, as follows:
   (a) Turn off or disconnect the DC loop current.
   (b) Plug the test cable of the Test Set into the TEST connector of the Keyer to be adjusted.
   (c) Set the Mode Selector switch on the Test Set to the desired baud rate.
   (d) Set the FUNCTION Selector switch on the Test Set to REV. OUT.
   (e) Connect the ground lead of an oscilloscope to the COM test point (GND) on the Test Set.
   (f) Connect the vertical input lead of the oscilloscope to the BIAS test point (SYM) on the Test Set.
   (g) Set the oscilloscope for internal synchronization.
   (h) Adjust the BIAS control for zero bias error.

Note

Zero bias error is obtained when the time of the MARK and SPACE times are equal. For the purpose of this adjustment procedure, a SPACE Baud time is measured from the beginning of the MARK to SPACE transition to the beginning of the SPACE to MARK transition.

The time of a MARK Baud is measured from the beginning of the SPACE to MARK transition to the beginning of the MARK to SPACE transition.

   (i) Turn the BIAS control counterclockwise until breaking up of the signal on the oscilloscope occurs or the control stop is reached. Mark this position of the control. Turn the BIAS control clockwise until breaking up of signal occurs, and mark the position of the control. Set the BIAS control midway between these two points.
   (j) Disconnect the test equipment.

c. CONTROL - ATTENUATOR. -
   (1) Plug the test cable of TS-2232A/UCC-1C(V) into the TEST connector on the front panel of the Control - Attenuator.
   (2) Set the FUNCTION SELECTOR switch on the Test Set to TONE IN.
   (3) Adjust the OUTPUT LEVEL control on the panel of the Control-Attenuator to obtain a composite tone output level of 0 (zero) dbm.

d. CONVERTER -
   (1) PRELIMINARY SETTINGS - In turn, withdraw each Converter from the cabinet and set the switch on the Converter as follows:
      (a) Set the TONE INPUT switch to one of the following positions to connect the Converter to the proper input connector.
         1 PARALLEL - RCVR A to connect the Converter to the PARALLEL TONES RCVR A input connector.
         2 PARALLEL - RCVR B to connect the Converter to the PARALLEL TONES RCVR B input connector.
         3 INDIV to connect the Converter to the individual input line associated with the station in the Cabinet into which the Converter is plugged.
         4 When Diversity switch is set to the FOUR position, Converters of the same frequency must be set to receive tones from separate audio sources.
      (b) Set the SIGNAL SENSE switch as follows:
         1 To NORMAL for a system in which space frequencies are higher than channel center frequencies.
         2 To REVERSE for a system in which space frequencies are higher than channel center frequencies.
      (c) Set the DIVERSITY switch to ONE.
      (d) If neutral, (HI) keying is used; use Test Set, Telegraph, TS-2232A/UCC-1C(V) to monitor loop current and adjust the d-c current of each output loop as follows:
         1 Plug the test cable of the Test Set into one of the Converters in the loop.
         2 Set the FUNCTION SELECTOR switch of the Test Set to TONE OUT.
         3 Set the TONE SELECTOR switch of the Test Set to the channel frequency being adjusted.
         4 Set the MODE SELECTOR switch of the Test Set to MARK in a system in which space frequencies are lower than the center frequency. Set the MODE SELECTOR switch to SPACE in a system in which the space frequencies are higher than the channel center frequency.
         5 Adjust the resistance of the signal loop to obtain an indication of 60 ma or 20 ma on the Test Set meter, depending on the loop power supply.

Note

Initial calibration and adjustment should be performed at or near the intended ambient operating temperature for the equipment. If the system is operated at a significantly different temperature, discriminator balance and bias adjustment should be rechecked to obtain optimum performance. Turn off or disconnect DC LOOP.

(2) DISCRIMINATOR BALANCE ADJUSTMENT. - Balance the discriminators of each Converter as follows:
   (a) Set the Converter switches to the following positions:
      1 Diversity switch to ONE
      2 Tone Input switch to INDIVIDUAL
   (b) Place the Test Set switches to the following positions:
      1 Power switch to OFF
      2 Function Select switch to TONE OUT
      3 Tone Select swtich to frequency of the converter to be adjusted.
      4 Mode Select switch to MARK
   (c) Set the oscilloscope switches to the following conditions:
      1 Vertical Sensitivity to .2 Volts/cm
      2 Input to DC
      3 Sweeptime to 1 ms/cm
      4 Trigger Source to Internal
      5 Sweep Mode to Free Run
   (d) Plug the test cable of the Test Set into the Test connector of the Converter to be adjusted.
   (e) Connect the vertical input of the oscilloscope with a 10:1 probe to DISC A jack and the probe ground to the DISC B jack on the Test Set.
   (f) Adjust the Vertical Position control of the oscilloscope to position the sweep in the center of the graticule. This will be reference level of the Discriminator output.
   (g) Energize the Test Set and place the Mode Select switch to MARK. Note the direction and amount of deflection of the scope sweep.
   (h) Place the Mode Select switch to SPACE. Note the direction and amount of deflection of the scope sweep.
   (i) Withdraw the Converter chassis and adjust the DISC BAL control on the top channel of the converter module until the deflection for MARK and SPACE tones are exactly equal and opposite.
   (j) Perform steps (a) through (i) for each Converter being adjusted.

(3) BIAS ADJUSTMENT - Adjust the bias to remove distortion during NORMAL TRAFFIC CONDITIONS as follows:
   (a) Present installation guidelines place the negative side of the Converter loop circuit at ground potential. With the presence of this ground and with the oscilloscope properly grounded by the AC power cord, the scope probe ground lead must NOT be connected to the Converter Test connector.

Note

If the converter loop circuit is not grounded, the oscilloscope must be operated above ground. This is achieved by disabling the ground at the plug of the AC Power cord. The use of a 3-prong to 2-prong adaptor will accomplish this. The scope probe ground lead must now be connected to - LOOP test point on the Converter Test Connector (J1-C).

Warning

Care must be taken to avoid shock hazard when using the oscilloscope under this condition.

   (b) Set the socilloscope controls to the following positions:
      1 Input to DC
      2 Sensitivity to 5 Volt/cm
      3 Trigger Source to INTERNAL
      4 Trigger Slope to - (Negative)
      5 Sweep Mode to PRESET
      6 Sweep Time to 2 ms/cm

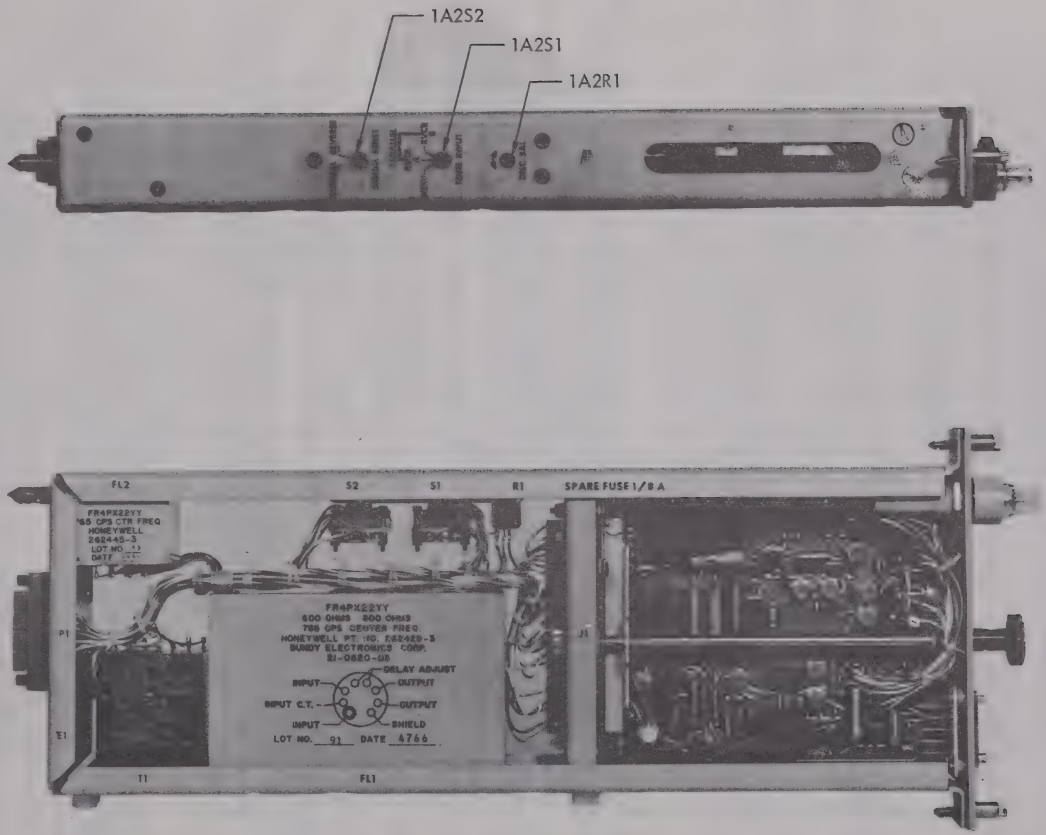


Figure 2-17. Converter, Frequency Shift CV-1920A(P)/UCC-1C(V), Top and Left Side Views

(c) Using a 10:1 probe, connect the vertical input of the oscilloscope to the Converter test connector + LOOP (J1-A).

(d) While receiving traffic signals (keyed tones) from the distant station, adjust the scope Trigger Level control until a stable sweep is present. Adjust the scope Horizontal Position control so that the beginning of the sweep is at the left edge of the graticule. Refine the Trigger Level Level control to display a MARK to SPACE (negative going) transition at the beginning of the the sweep.

(e) Under this condition the first portion of the sweep will display a SPACE signal. The total duration of this SPACE is dependent on the number of SPACE Bauds occurring after the scope is triggered.

(f) Measure the minimum duration of the SPACE signal, which represents one SPACE Baud.

(g) Set the scope Trigger Slope to + (positive). Adjust the Trigger Level control until a SPACE to MARK transition occurs at the beginning of the sweep. A MARK signal will now be displayed at at the beginning of the sweep. Measure the minimum duration of this signal,which represents one MARK Baud.

(h) Adjust the Converter BIAS for equal MARK and SPACE Baud time.

NOTE

For the purpose of this adjustment, a SPACE Baud time is measured from the beginning of the MARK to SPACE transition to the beginning of the SPACE to MARK transition. The time of a MARK Baud is measured from the beginning of the SPACE to MARK transition to the beginning of the MARK to SPACE Transition. This bias adjustment procedure assumes the use of synchronous telegraph signals as the input to the Keyer. In the event a 7.42 Baud Start/Stop teletype signal is used, the extended time of the Stop Baud must be considered when measuring the MARK Baud duration.

(4) ADJUSTMENTS FOR DIVERSITY OPERATION – Perform the following procedures to provide diversity operation. (See figure 2-17).

(a) DELAY EQUALIZATION – Turn the DELAY Adjust control fully counterclockwise on all Converters in the diversity group. Unless specifically directed by other procedures the Delay Adjust control will be left in this position.

(b) DIVERSITY BALANCE – This procedure identifies the converter in a diversity combination which has the least gain and uses that particular converter as a reference to which the other converters in the diversity group are adjusted thus providing equal gain for all converters in the diversity group.

1 Turn the DIV BAL controls on all Converters in the diversity group fully clockwise.

2 Set the DIVERSITY switch on all Converters in the diversity group to the ONE position.

3 Set the TONE INPUT switch (1A2S1) on all Converter of the diversity group to the REC-A position. Insure that no signals are patched to the REC-A input at the audio patch panel.

4 Connect an Audio Oscillator to the REC A test point and COMMON of the Test Connector.on the Control Attenuator.

5 Adjust the audio oscillator to the highest center frequency (±3 Hz) of the diversity group at a level of -20 dbm.

6 Measure the DC voltage (AGC Detector Output) on the Converters having the higher center frequency of the diversity group.

Connect a multimeter, set to the +10 Vdc Scale, the negative (-) lead to COM and the positive (+) lead to Test Point R of the Test connector on the converter. Record this measurement for reference.

7 Adjust the audio oscillator to the lower center frequency (±3 Hz) of the diversity group at level of -20 dbm.

8 Measure the dc voltage (AGC Detector Output) between COM and Test Point R of the test connector on the converters of the diversity group having this lower center frequency. Record the measurements for reference.

9 The Converter with the highest AGC Detector Output voltage recorded in steps 6 and 8 is the Converter of the diversity group having the least gain. This converter is the reference to which the remaining converters of the diversity group will be adjusted.

10 Connect the multimeter between COM and test point R of the test connector on a converter with a lower AGC Detector output; tune the audio oscillator to the center frequency for this converter ±3 Hz at a level of -20 dbm. Adjust the DIV BAL control (R-26) until the AGC Detector voltage is equal to the AGC Detector voltag of the highest voltage, reference Converter, recorded in steps 6 and 8. Repeat this step for the remaining Converters in the diversity group which have low AGC Detector Voltage.

11 Repeat steps 1 through 10 for all diversity groups in the system.

NOTE

The frequency counter AN/USM-207 ( ) should be used to measure the output frequency of the audio oscillator to insure the desired frequency is obtained.

(c) Place all TONE INPUT switches and DIVERSITY switches to the proper position for the desired mode of operation.

NOTE

For two-channel operation, the Converters in Cabinet stations A1, A3, A5, and A7 are active d-c loops (DC LOOPS connector). For four-channel diversity operation, the Converters in Cabinet stations A1 and A5 are active d-c loops.

(d) LOOP CURRENT ADJUSTMENT. – For loop current adjustment during diversity operat check to insure that the procedure given in paragraph 2-4d(1)(d) was performed for Conv in stations A1, A3, A5, A7, for two-channel diversity operation and for the Converters i stations A1 and A5 for four-channel diversity operation.

2-5. INTERFERENCE REDUCTION

For minimum interference, connect the negative side of each d-c loop to ground. The loop curren rheostat must be connected in the positive leg of the external loop power supply.

SECTION 3

OPERATOR'S SECTION

3-1. FUNCTIONAL OPERATION.

a. Telegraph Terminal AN/UCC-1D(V) operates automatically in various types of telegraph transmission systems. It accepts d-c telegraph signals and converts them into voice-frequency signals at the transmission end of a communication link; voice-frequency signals from up to 16 channels are combined on a single communication circuit. At the opposite end of the communication link, the Telegraph Terminal separates the voice-frequency signals and converts them to electronic keying signals for receiving telegraph loops. Provisions are incorporated for either low level polar or high level neutral keying.

b. The Telegraph Terminal comprises different numbers of modules, as required for specific system configurations and capacities. Transmitting and receiving conversions between telegraph loop keying signals and voice-frequency signals are performed by Cabinet-housed Keyers and Converters. Switches on the Keyers and Converters determine the system interconnection between the modules. A Test Set provides special meter circuitry, a reversal generator, and a tone generator to aid in adjustment of the Telegraph Terminal.

3-2. OPERATING PROCEDURES.

Once the Telegraph Terminal is installed, initial switch setting and adjustments have been made (see Section 2), and power is applied (b, below), equipment operation is automatic. Operator attention is not required except for starting and stopping procedures, and for testing equipment operation with the Test Set or auxiliary equipment.

a. DESCRIPTION OF CONTROLS. - Except for Test Set controls used during operator's maintenance (see paragraph 3-3), only the power switch (115 VAC/230 VAC) is used by the operator. Telegraph Terminal front-panel controls and their functions are listed below; procedures for their use are located in Sections 2 and 5.

(1) CONTROL-ATTENUATOR (see figure 3-1)

(a) FUSES - Two 1-ampere fuses which protect the two sides of the a-c line.

(b) ATTEN FUSE - A 1/8-ampere fuse which protects the power supply circuit in the Control-Attenuator module.

(c) MAIN POWER indicator - Lights to indicate power is on.

(d) 115 VAC/230 VAC power switch - Controls and indicates application of line power to modules housed in the cabinet (115 volts or 230 volts) depending on the power source, and the internal wiring of the Cabinet).

(e) LEVEL control - A screwdriver adjustment for setting the level of Control-Attenuator output signals.

(f) TEST connector - Provides a means of connecting Control-Attenuator test points to the Test Set quickly and easily.

(g) TONE OUT - Two test points for monitoring the composite parallel-tones transmit signal lead output.

(h) RCVR A - Test point for monitoring the composite parallel-tones receive signal applied to the PARALLEL TONES RCVR A connector.

(i) RCVR B - Test point for monitoring the composite parallel-tones receive signal applied to the PARALLEL TONES RCVR B connector.

(j) +12V - Test point for monitoring the +12V power in the Control-Attenuator.

(k) COM - Test point for monitoring common (signal ground) in the Control-Attenuator.

(2) KEYER (see figure 3-2)

(a) FUSES - A 1/8-ampere fuse which protects the power supply circuit in the Keyer module. This fuse is located on the Keyer front panel.

(b) BIAS control - A screwdriver adjustment for obtaining zero bias distortion of the voice-frequency signal. Can be detected as either an average frequency equal to the channel center

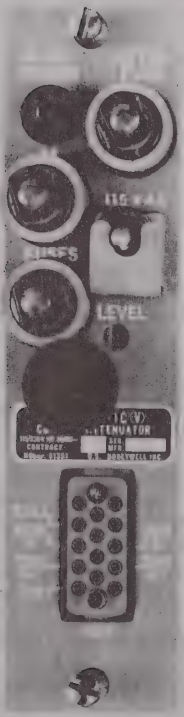


Figure 3-1. Control-Attenuator, Front Panel

Figure 3-2. Keyer, Front Panel

frequency on a frequency counter or as a symmetrical square wave when monitoring the BIAS test point with an oscilloscope.

(c) TONE control - A screwdriver adjustment for obtaining the required output power level (monitored at TONE test points with either the Test Set or auxiliary equipment).

(d) TONE switch - A screwdriver actuated switch for removing the v-f output of the Keyer from the composite tone line.

(e) DIVERSITY switch - A screwdriver actuated switch for setting the d-c input loop diversity combination.

(f) TEST connector - Provides a means of connecting Keyer test points to the Test Set quickly and easily.

(g) + LOOP/- LOOP - Two test points for monitoring the d-c input loop current by determing the voltage drop across an internal 47-ohm resistor. The -LOOP test point is connected to Keyer circuit ground (common).

(h) +3V/+12V-6.8V - Three test points for monitoring the output voltage levels of the Keyer power supply circuits.

(i) TONE OUT - Two test points for monitoring tone output level.

(j) COM - Test point connected to common (circuit ground).

(k) BIAS - Test point for monitoring the symmetry of the output of the Schmitt-trigger circuit that controls the switching of the mark and space oscillators.

(3) CONVERTER (see figure 3-3)

(a) FUSE - 1/8-ampere fuse which protects the power supply circuit in the converter module. This fuse is located on the front panel.

(b) BIAS control - A screwdriver adjustment for obtaining zero bias distortion in the d-c output loop.

(c) DELAY control - A screwdriver adjustment for equalizing system delays by varying the time delay through the input filters.

(d) DIV BAL - A screwdriver adjustment for equalizing the gain of the AGC amplifiers when operating in the diversity mode.

(e) DIVERSITY switch - A screwdriver actuated switch for setting the converter interconnections for individual diversity (two-channel or four-channel) operation.

(f) TEST connector - Provides a means of connecting Converter test points to the Test Set quickly and easily.

(g) +LOOP/-LOOP - Two test points for monitoring the d-c output loop current by determining the voltage drop across an internal 47-ohm resistor.

(h) +12V - Test point for monitoring the output voltage level of the Converter power supply circuit.

(i) AGC - Test point for monitoring the output level of the AGC amplifier.

(j) DISC A-DISC B - Two test points for monitoring the floating output of the discriminators. (The ground lead of the oscilloscope should be connected to DISC B.)

(k) BAL - Test point for monitoring the input to the discriminator.

(l) COM - Test point connected to common (circuit ground).

(m) TONE IN - Test point for injecting a signal to the AGC circuits to test the performance of the internal circuitry.

(n) AGC DETECTOR OUTPUT (J1-R) – used to monitor AGC detector output for diversity balance adjustment.

(4) TEST SET (see figure 3-4)

(a) FUSES/LINE 1/8 A - Protect the Test Set power supply circuit.

(b) POWER indicator - Lights to indicate power is on.

(c) 115V/230V power switch - Controls and indicates application of line power to Test Set (115 volts or 230 volts depending on the power source and the position of the locking guard.)

(d) READ/IND. switch – Operates in conjunction with the FUNCTION SELECTOR switch to determine the function of the panel meter. In IND position, an indication within the green band is acceptable; in READ position, actual values are measured.

(e) FUNCTION SELECTOR switch – connects Telegraph Terminal functions from test cable to panel meter. The meaning of the panel meter indication depends upon the position of the READ/IND switch discussed in 1a and 1b below for each position of the FUNCTION SELECTOR switch.

Figure 3-3. Converter, Front Panel

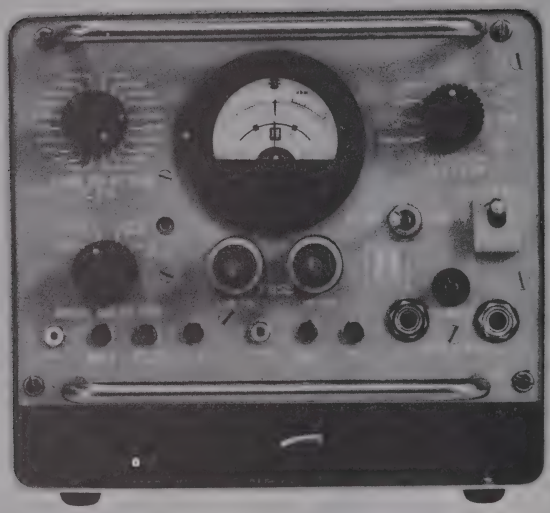


Figure 3-4. Test Set, Front Panel

1 TONE IN position - Connects tone from module to meter circuit and loudspeaker.

a READ position - Actual level of the input signal is indicated on the DBM scale of the panel meter.

b IND position - 0 dbm ±2 dbm input signal is indicated by a meter reading within the green band.

2 LOOP CUR. position - D-C loop current is determined by measuring the voltage drop across a 47-ohm resistor located in the module being tested. (The resistor is provided in each module.) This position is not used if LO level polar keying is used.

a READ position - Actual value of the loop current is indicated on the panel meter at a sensitivity of 100 ma full scale.

b IND position - A loop current of 60 ma ±5 ma produces a meter indication within the green band.

3 +12V position - Connects the +12 volt power supply in the module being tested to the panel meter voltage measuring circuit.

a READ position - Actual value of the voltage is indicated on the panel meter at a sensitivity of 20 volts full scale.

b IND position - A power supply of +12 volts ±5 percent produces a meter indication within the green band.

4 -6.8V position - Connects the -6.8 volt power supply (Keyer module only) to the panel meter voltage measuring circuit.

a READ position - Actual value of the voltage is indicated on the panel meter at a sensitivity of 10 volts full scale.

b IND position - A power supply of -6.8 volts ±5 percent produces a meter indication within the green band.

5 +3V position - Connects the +3-volt power supply (Keyer module only) to the panel meter voltage measuring circuit.

a READ position - Actual value of the voltage is indicated on the panel meter at a sensitivity of 10 volts full scale.

b IND position - A power supply of +3 volts ±5 percent produces an indication within the green band.

6 PHASE/LO position - Connects output of phase-adjustment measurement network to panel meter through series resistance for low-sensitivity indication.

7 PHASE/HI position - Connects output of phase-adjustment measurement network to panel meter for high-sensitivity indication.

8 TONE OUT position - Provides a steady tone for aligning Converter modules at the channel frequency selected by the TONE SELECTOR switch and at either the mark or space frequency as selected by the MODE SELECTOR switch.

9 REV. OUT position - Provides a d-c loop current for triggering a Keyer module as selected by the MODE SELECTOR switch.

(f) MODE SELECTOR switch - This switch selects the mode of the tone or reversals output depending on the position of the FUNCTION SELECTOR switch.

1 MARK position -

a Provides a steady mark current to a Keyer module when the FUNCTION SELECTOR switch is in the REV. OUT position.

b Provides a steady mark frequency for the channel selected by the TONE SELECTOR switch when the FUNCTION SELECTOR switch is in the TONE OUT position.

2 SPACE position -

a Provides a steady space signal to a Keyer module when the FUNCTION SELECTOR switch is in the REV. OUT position.

b Provides a steady space frequency for the channel selected by the TONE SELECTOR switch when the FUNCTION SELECTOR switch is in the TONE OUT position.

3 150 BAUD position - Provides alternate d-c marks and spaces (dot-cycle) from the reversals generator to a Keyer module at 150 baud when the FUNCTION SELECTOR switch is in the REV. OUT position.

4 75 BAUD position - Provides alternate d-c marks and spaces (dot-cycle) from the reversals generator tc a Keyer module at 75 baud when the FUNCTION SELECTOR switch is in the REV. OUT position.

(g) TONE SELECTOR switch- Provides a steady tone to a Converter module at either the mark frequency or the space frequency (determine by the MODE SELECTOR switch) when the FUNCTION SELECTOR switch is in the TONE OUT position. (See Table 4-1.)

(h) AGC jack - A test jack for monitoring the AGC test point of a Converter when the test cable is plugged into the Test connector of the Converter. In effect, extends the AGC test point to the front panel of the Test Set.

(i) DISC A/RCVR A jack - A test jack for monitoring the DISC A test point of a Converter or the RCVR A test point of a Control-Attenuator when the test cable is plugged into the TEST connector of the module. In effect, extends the DISC A or RCVR A test point to the front panel of the Test Set.

(j) DISC B/RCVR B jack - A test jack for monitoring the DISC A test point of a Converter or the RCVR A test point of a Control-Attenuator when the test cable is plugged into the TEST connector of the module. In effect, extends the DISC A or RCVR A test point to the front panel of the Test Set.

(k) DIV BAL jack - A test jack for monitoring the BAL test point of a Converter when the test cable is plugged into the TEST connector of the Converter. In effect, extends the BAL test point to the front panel of the Test Set.

(l) SYM jack - A test jack for monitoring the BIAS test point of a Keyer when the test cable is plugged into the TEST connector of the Keyer. Used for adjustment of Keyer symmetry.

(m) PHASE ADJ jack - A test jack for connecting the + LOOP test point of one Converter (pin A) to the Test Set while the test cable is plugged into the TEST connector of another Converter to permit phase comparison for the delay adjustment for diversity operation.

(n) COM jack - A test jack for circuit ground (the COM test point) of a module or of other test equipment to circuit ground of the Test Set.

(o) AMPLIFIER IN jack - A telephone jack connected to the input of the signal tracing amplifier in the Test Set for operation with 500 or 1000 ohm headphones.

b. SEQUENCE OF OPERATION. - The operating procedures for the equipment are the procedures for starting and stopping the equipment. Once started, the equipment requires no operator attention, except for the maintenance procedures and Test Set applications described in paragraph 3-3.

(1) STARTING PROCEDURE. -

(a) Set the power switch on the Control-Attenuator in each Cabinet to the on position (115 VAC or 230 VAC depending upon the power source).

(b) Make sure that the MAIN POWER indicator lights and that none of the fuse indicators, on the front panels of the modules in the cabinet, light.

Note

If the Test Set is to be used, set its power switch to 115V or 230V depending on the power source, and make sure that the LINE FUSE indicator does not light.

(2) STOPPING PROCEDURE. - Set the power switch (marked 115 VAC/230 VAC) on the Control-Attenuator in each Cabinet to the off (center) position. (If the Test Set is in use, set its power switch to the off position.) This procedure applies also in emergencies.

3-3. OPERATOR'S MAINTENANCE.

Operator's maintenance consists of operating checks, preventive maintenance, and emergency maintenance.

a. OPERATING CHECKS. - The Telegraph Terminal operates automatically, requiring attention, or maintenance by the operator only in cases of malfunction. The following quick checks may be used at the start of the operating period to assure proper operation. If they are performed correctly, the quick check may be used to verify correct operation.

Note

Before plugging the test cable of the Test Set into the TEST connector of a module, make sure that the FUNCTION SELECTOR switch of the Test Set is in the correct position. If it is in the wrong position, signals from the Test Set will interrupt the operation of the Telegraph Terminal.

(1) KEYER CHECKS. - High level (neutral keying) only - (see figures 3-2 and 2-16).

(a) Set the FUNCTION SELECTOR switch of the Test Set to LOOP CUR.

(b) Plug the test cable of the Test Set into the TEST connector of the Keyer module. Observe that the meter indicates the current given in either 1 or 2 below:

1 Either 20 ma or 60 ma with the Keyer input in the steady marking condition. The current depends on the external loop supply.

2 Either 10 ma or 30 ma with a reversal signal applied to the Keyer.

(c) Set the FUNCTION SELECTOR switch to TONE IN and check for the indications given in 1 and 2 below:

1 A meter indication of approximately zero dbm to +12 dbm depending upon the number of Keyers being used.

2 Either a steady audible tone which indicates application of a steady marking or spacing bias, or a variable tone, which indicates application of a reversal signal.

Note

The tone frequency depends on the channel frequency.

(d) If the correct indications were not obtained in (b) and (c) above, proceed to the emergency maintenance instructions.

(2) CONVERTER CHECKS. - (see figures 3-3 and 2-17)

(a) Connect the Test Set to the Converter using a patch cord with a telephone jack on one end and two tip probes on the other end, as follows:

1 Insert the telephone plug into the AMPLIFIER IN jack on the front panel of the TEST SET.

2 Insert the ground tip probe into the COM test point of the Converter TEST connector.

3 Insert the signal tip probe into the AGC test point of the Converter TEST connector.

(b) Observe a meter deflection and listen for a varying audible tone indicating that a frequency-shift keyed (FSK) signal is being applied to the Converter. The frequency of this tone depends on the channel frequency.

Note

If the Converters are operating in a diversity combination, only the Converter with the strongest signal level will indicate a tone. Converters of the same frequency must be set to receive parallel tones from separate audio sources.

(c) Remove the patch cord and connect the TEST SET test cable to the Converter TEST connector.

(d) High level neutral operation only – Set the FUNCTION SELECTOR switch of the Test Set to LOOP CUR., and check for the current given in either 1 or 2 below:

1 Either 20 ma or 60 ma with the Converter in the steady marking condition. The current depends on the external loop supply.

2 Either 10 ma or 30 ma if a reversal signal is being applied to the Converter.

Note

If the Converters are operating in a diversity combination, a meter indication will be obtained only from the output Converters. The output Converters for two-channel diversity are located in Cabinet stations A1, A3, A5, or A7. The output Converters for four-channel diversity are located in Cabinet stations A1 or A5.

(e) If the correct indications were not obtained in (b) and (d), proceed to the emergency maintenance instructions.

(3) CONTROL-ATTENUATOR CHECKS. - (see figures 3-1 and 2-15)

Note

This test applies only if the Control-Attenuator is being used in conjunction with Keyer modules.

(a) Connect the Test Set test cable to the Control-Attenuator TEST connector.

(b) Set the FUNCTION SELECTOR switch of the Test Set to TONE IN and check for the indications given in 1 and 2 below:

1 A meter indication of approximately zero dbm.

2 Either a steady audible tone which indicates application of a steady marking or spacing bias, or a variable tone which indicates application of a reversal signal.

Note

The frequency of the tone depends on the channel frequency.

(c) If the correct indications were not obtained in (b) proceed to the emergency maintenance instructions.

b. PREVENTIVE MAINTENANCE. - Refer to the Reference Standards Book for preventive maintenance instructions.

c. EMERGENCY MAINTENANCE. -

(1) DEFECTIVE POWER FUSES.

CAUTION

Replace a defective fuse only with one of the correct value.

(a) A blown power fuse on the Control-Attenuator, Keyer, or Converter is identified by a lighted blown-fuse indicator on the front panel of the unit (see figures 3-1, 3-2, and 3-3). For spare fuse location on the Control-Attenuator, Keyer, and Converter, see figures 2-15, 2-16, and 2-17, respectively.

(b) A blown power fuse on the Test Set is identified by a lighted blown-fuse indicator on the front panel.

(2) DEFECTIVE D-C LOOP FUSES.

CAUTION

Replace a defective fuse only with one of the correct value.

(a) A blown d-c loop fuse on a keyer (located in 1A1XF1) is evident when the associated teletypewriter equipment remains in a steady spacing condition or when no indication is obtained in the performance of the Keyer loop current check a(1)(b). For d-c loop fuse location, see figure 2-16.

(3) DEFECTIVE KEYER. - A defective Keyer can be replaced by one (of the same channel frequency) known to be operative. Replace a defective Keyer Front Chassis Assembly with any Keyer Front Chassis Assembly known to be operative.

(4) DEFECTIVE CONVERTER. - A defective Converter can be replaced by one (of the same channel frequency) known to be operative. Replace a defective Converter Front Chassis Assembly with any Converter Front Chassis Assembly known to be operative.

(5) DEFECTIVE CONTROL-ATTENUATOR. - A defective Control-Attenuator can be replaced by any other Control-Attenuator known to be operative. Replace a defective Control-Attenuator Front Chassis Assembly with any Control-Attenuator Front Chassis Assembly known to be operative.

SECTION 4

TROUBLESHOOTING

4-1. OVER-ALL FUNCTIONAL DESCRIPTION.

a. The functions that can be performed by the Telegraph Terminal are shown in figure 4-5. The terminal provides up to 16 different narrow-band voice-frequency tone channels, each passing a different band of frequencies; see Table 1-1. Associated with each channel are two oscillators and a gate circuit. One oscillator constantly generates the mark frequency; the other constantly generates the space frequency. The gate circuit is keyed by a telegraph loop causing one frequency or the other to pass (frequency-shift keying). The two frequencies are symmetrically disposed with respect to the center of the channel pass-band. The output from any set of different channels can be combined on a single line for transmission over a single 3-Kilohertz communication link.

b. Two 3-Kilohertz bandwidth voice-frequency signals can be accommodated by the Telegraph Terminal, for transmission over a single 6-Kilohertz communication link. The two 3-Kilohertz signals may contain 16 telegraph tone channels in each 3-Kilohertz band or 16 telegraph tone channels in one 3-Kilohertz signal and speech in the other 3-Kilohertz signal.

c. Diversity combination switching is provided in the telegraph terminal at both the transmitting and receiving stations; thus, one telegraph signal can be used to key two different tone channel (Keyers) at the transmitting station. In this case, the corresponding tone channels (Converters) at the receiving station both develop keying signals. However, the best signal of the diversity pair operates the receiving telegraph loop, thereby preserving the telegraph signals when fading occurs in one of the two channels in the frequency-diversity pair.

d. Diversity switching at the receiving station also permits space-diversity of r-f diversity operation, in which tone signals obtained from two different radio receivers are used to operate two identical sets of tone channels. For this type of operation, each pair of identical tone channels (Converters) provides a single keying signal. Frequency-diversity operation can be combined with either space-diversity or r-f diversity operation. In this case, one set of four tone channels produces a single keying signal.

e. In place of 16 narrow-band channels, the Telegraph Terminal can provide eight narrow-band and four wide-band channels. The wide-band channels use the band portion of the upper eight narrow-band channels plus the band extending from 3025 to 3815 Hz. However, extension of the wide-band channels above 3265 Hz prevents the use of the multiplexing function.

f. The Telegraph Terminal is modular in construction so that the number of channels provided can be varied by increasing or decreasing the total number of modules. Some specific system configurations are shown in figures 1-5 through 1-11.

g. Special test facilities required to align the Telegraph Terminal are incorporated in the portable Test Set.

4-2. INTEGRATED CIRCUITS.

Integrated circuits of two types, a differential amplifier and a flip-flop, are used throughout Telegraph Terminal AN/UCC-1D(V). Although each integrated circuit is housed in a transistor enclosure, it performs a much more complex function than a single transistor. External electronic components such as resistors and capacitors are used with integrated circuits, as they are with transistors, when the application of the device requires their use. Paragraphs 4-2 and 4-3 present the schematic symbols used to represent integrated circuits in this technical manual, a discussion of the construction and operation of each type of integrated circuit used in this equipment, and a discussion of the various applications of these devices.

a. SCHEMATIC SYMBOLS. - Standard schematic symbols for integrated circuits have not been adopted as yet. The symbols used to represent the differential amplifier and the flip-flop have been approved for use in this technical manual by the Naval Ship Systems Command. These symbols were developed by placing the standard logic symbol for the circuit within a standard envelope or enclosure. All signal paths have been drawn through the envelope to the logic symbol. Other

connections to the circuit such as voltage supplies, common connections, gain control, and operating bias are drawn only to the envelope. To understand fully the schematic diagrams employing these symbols, it will be necessary to study the schematic diagrams and explanations of the integrated circuits presented in these paragraphs.

b. CONSTRUCTION OF INTEGRATED CIRCUITS. - The integrated circuit consists of a number of transistors or diodes and other circuit elements formed on a single substrate or chip of N-type, doped silicon crystal. The circuit elements are formed on this substrate by semiconductor construction methods including masking, oxide photolithographic etching, diffusion, evaporation, epitaxial growth, and deposition. Then, lead wires are connected to the integrated circuit by thermal compression bonding and it is sealed in the enclosure or envelope. The integrated circuit is in modified TO-5 transistor can and is not repairable.

c. DIFFERENTIAL AMPLIFIER. - Figure 4-1 shows the schematic symbol and the internal schematic diagram of the differential amplifier. Signal inputs are applied to leads 2 and 3 of the integrated circuit, the bases of Q1 and Q2 which are shown in the internal schematic diagram. These input signals are amplified by Q1 and Q2 and applied to the bases of output emitter followers Q3 and Q4 respectively. Output signals from the emitter followers are available at leads 10 and 7 of the integrated circuit. In addition, the output signals at the collectors of Q1 and Q2 are available at leads 1 and 6 of the integrated circuit. The constant current source for Q1 and Q2 is Q5 which determines the gain of the differential amplifier by determining the emitter currents of Q1 and Q2. The gain of the amplifier may be controlled by applying a signal to the base of Q5 through R6 at lead 8 of the integrated circuit. The emitters of Q1 and Q2 are brought out at lead 4 of the integrated circuit. This lead may be used to bypass the constant current source Q5 when the application requires. Leads 9 and 5 are the connection of B+ voltage and common respectively. Resistance values as noted on the schematic diagram are nominal and may vary quite widely from unit to unit. Care should be exercised if attempting to measure the internal component values to prevent erroneous readings due to internal connections and to prevent damage to the module by application of either excessive current or voltage or both.

d. FLIP-FLOP. - The flip-flop is a direct-coupled integrated circuit using resistor-transistor logic. Figure 4-2 shows the schematic symbol for the flip-flop and the internal schematic diagram of this circuit. The set and reset input signals are gated by identical input gates. The set gate consists of Q1, Q2, and Q3. The reset gate consists of Q6, Q5, and Q4. Input inverters Q1 and Q6 receive and invert the set and reset signals respectively. Transistors Q3 and Q4 sense the state of the inputs, and Q2 and Q5 prevent reaction when the clock input is low. Transistors Q8 and Q9 perform the function of charge storage. When either transistor is forward-biased with its base at a high level and its collector at a low level, its collector-base junction charges. This condition occurs only when the output of the transistor's gate is high, which in turn, occurs only when all three inputs to the gate are low. The output flip-flop (Q11 and Q12) is cross-connected to the gates. Because only one side is low at a time, only one transistor (Q8 or Q9) can charge at a time. The clock input is high during the charging cycle; it is inverted by Q7 to present a low level to the gates. As the clock pulse falls the collector of the charge-storage transistor goes high, releasing its charge. If the associated output flip-flop transistor (Q11 or Q12) is off, the charge drives it on. When either Q11 or Q12 is driven on, it drives the other transistor off. The preset driver Q10 is the means of assuring that the flip-flop is in the set condition when the application requires that the circuit be in a known condition. The preset signal at lead 6 of the integrated circuit is applied to the base of Q10, which functions just as Q11, turning Q12 off, and turning Q11 on.

4-3. APPLICATIONS OF THE INTEGRATED DIFFERENTIAL AMPLIFIER.

In addition to the basic application as a differential amplifier, the integrated differential amplifier is used in a crystal-controlled oscillator, and a free-running multivibrator. The adaption of this integrated circuit to these applications was undertaken in the design of Telegraph Terminal AN/UCC-1D(V) to improve reliability and to reduce the number of spare parts required. External electronic components are connected into the circuit to adapt it to these applications.

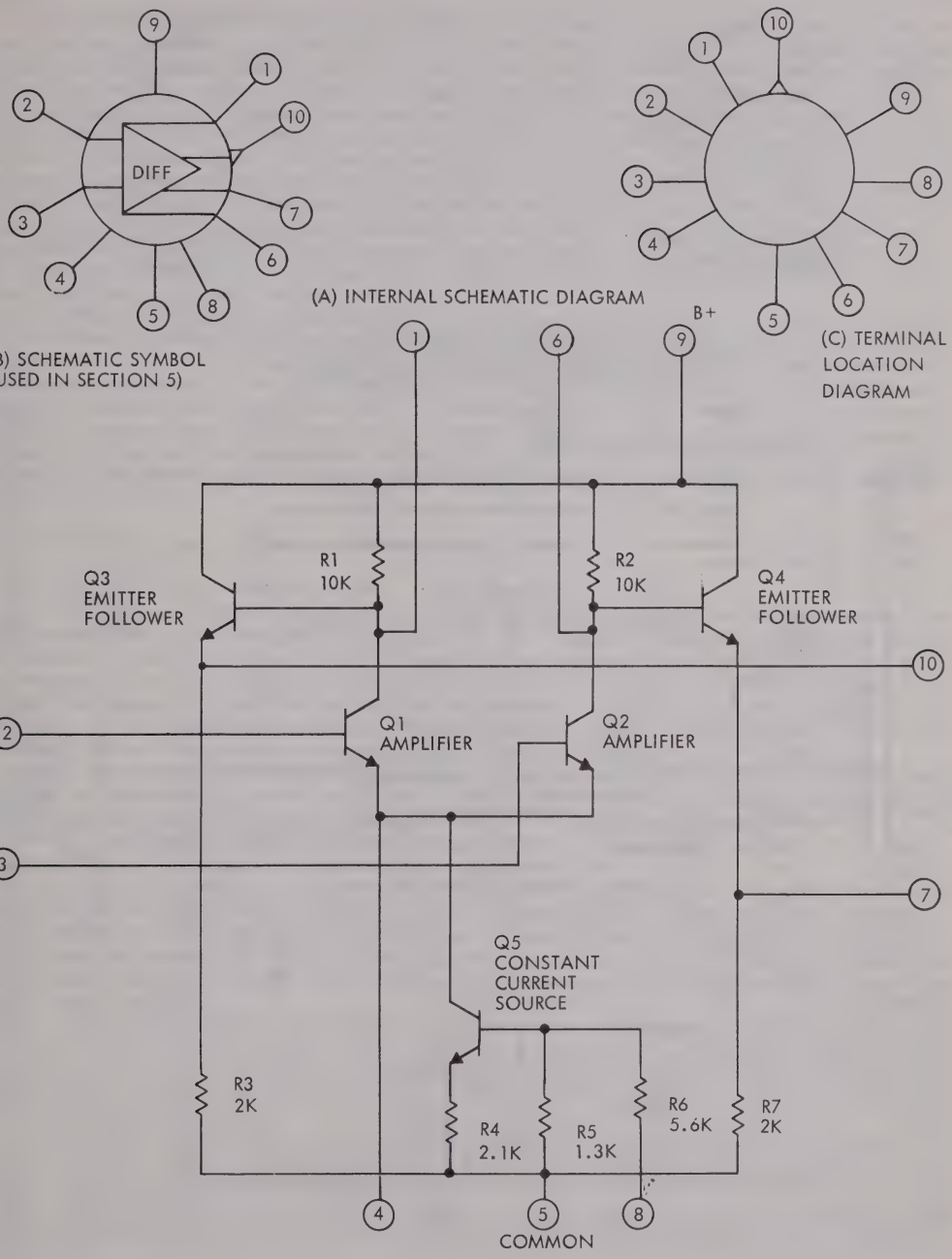
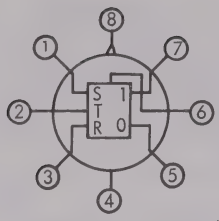
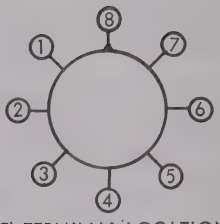


Figure 4-1. Differential Amplifier, Integrated Circuit Device



(B) SCHEMATIC SYMBOL
(USED IN SECTION 5)



(C) TERMINAL LOCATION
DIAGRAM

(A) INTERNAL SCHEMATIC DIAGRAM
NOTE: RESISTANCE VALUES ARE NOMINAL
INDICATES COMMON CONNECTION

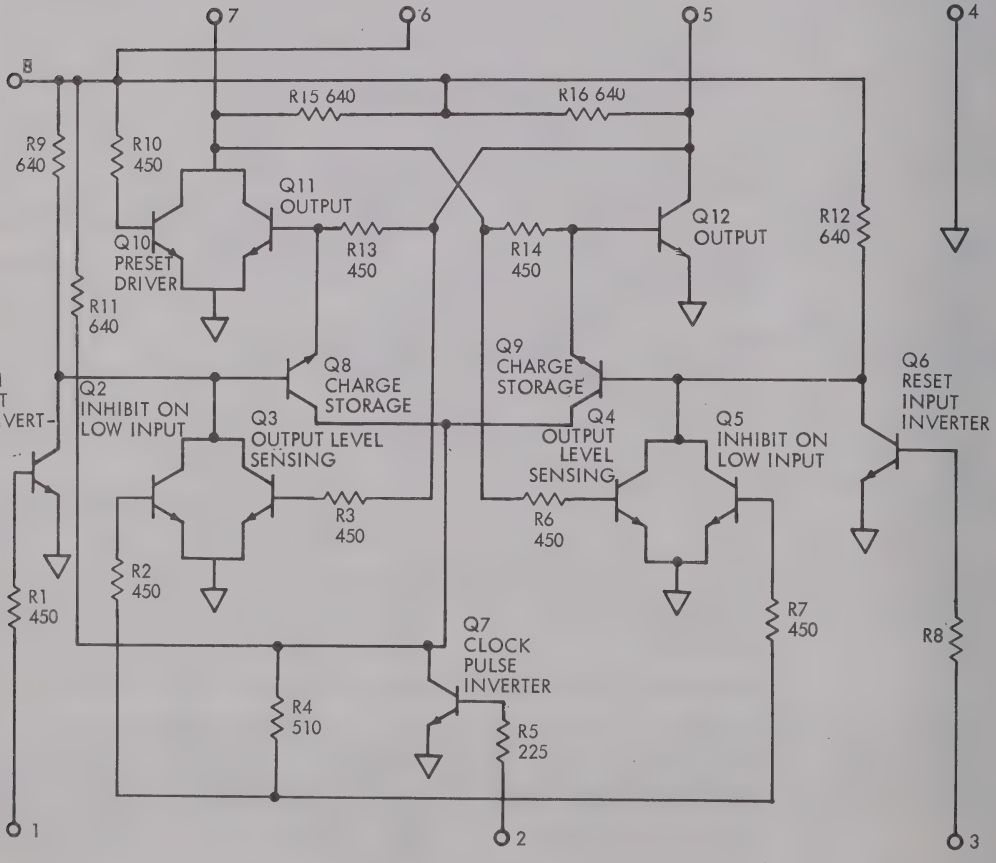


Figure 4-2. Flip-Flop, Integrated Circuit Device

a. CRYSTAL-CONTROLLED OSCILLATOR. - The crystal-controlled oscillator uses three of the five transistor sections of the integrated circuit. Figure 4-3 shows the schematic diagram and also the internal schematic diagram of this circuit. This oscillator consists of two amplifier stages in series with positive feedback from the output of the second stage to the input of the first stage. Refer to the internal schematic diagram, figure 4-3. Each of the amplifiers produces a phase shift of 180 degrees yielding the total phase shift of 360 degrees required in the feedback loop to sustain oscillation. When power is applied to the circuit, Q1 starts to conduct, furnishing a driving signal to the base of Q2. The output at the collector of Q2 is fed back to the frequency control crystal Y2, causing it to start oscillating. The output from Y2 is in phase with the signal at the base of Q1 driving Q1 and Q2 further into conduction. As the output of Y2 reverses, it drives Q1 and, in turn, Q2 toward cutoff. The downward swing at the collector of Q2 is in phase with Y2 and causes Y2 to resonate, producing the maximum output. The square wave produced at the collector of Q2 is fed out through an emitter follower Q4.

b. FREE-RUNNING MULTIVIBRATOR. - The free-running multivibrator uses three of the five transistor sections of the integrated circuits. Figure 4-4 shows the schematic diagram and also the internal schematic diagram of the circuit. The basic multivibrator consists of Q1, Q2 and r-c timing components. Transistor section Q4 is an output emitter follower. This circuit is essentially a collector-coupled multivibrator. The discharge path for C2 is toward +12 volts through R3. The discharge path for C1 is toward +12 volts through R1 and R2. The variable resistor R2 is used to balance the time constants of the two arms of the circuit. Diodes CR1, CR2, and CR3 protect the base-emitter junctions of the transistors from damage by the charge of approximately 12 volts on C1 and C2.

4-4. FUNCTIONAL SECTION DESCRIPTION. (see figure 4-5)

a. KEYER CIRCUIT DESCRIPTION. - (see figure 4-6)

(1) The d-c telegraph loop is connected to the Schmitt trigger circuit Q4-Q5 through the input switch circuit and the adjustable trigger-level bias control circuit. The adjustable bias sets the trigger level at one half the loop current value for neutral operation and at zero (±1 ma) current for polar operation. The input level applied to the Schmitt trigger is the sum of the trigger-level bias and the voltage drop produced by loop current through resistors of the input switch circuit. The change of input resistance for low or high loop operation assures that the voltage amplitude of the signals applied to the Schmitt trigger circuit is the same for both types of operation.

(2) In neutral operation, input transistor Q3 is turned on (conducting) when loop current flows and is turned off (not conducting) in the absence of loop current. In polar operation, Q3 is turned on during positive loop current and is turned off during negative loop current.

(3) With a mark input, the Schmitt trigger circuit will turn Q6 on and turn Q7 off. The conduction state of Q6 and Q7 will be reversed with a space input.

(4) The output signal of the gate control circuit and the output frequencies of the mark and space crystal-controlled oscillators (IC9 and IC10) are used to drive the diode gates. When the SIGNAL SENSE switch is in the NORMAL position, a loop current (mark input) causes the gate circuits to pass the output of the mark (higher frequency) oscillator. When the switch is in the REVERSE position, a loop current causes the gate circuits to pass the output of the space (lower frequency) oscillator.

(5) The mark and space oscillators operate at frequencies which are 128 times the mark and space frequencies of the channel. They are controlled by crystals to maintain the frequency within a close tolerance. Both oscillators operate at all times but the output of each is passed through its gate only when the gate is enabled by the gate control circuit. See Table 1-1 for the channel mark and space frequencies.

(6) The oscillator frequency passed through the gate is divided by 128 in the divider circuit. The divider is a seven-stage digital count-down circuit consisting of IC2 through IC8. Each stage is a flip-flop integrated circuit device.

(7) The output of the divider circuit (channel mark or space frequency) is applied through the output amplifier Q1 to the output bandpass filter. The input level to Q1 from IC8 is adjusted by R14 (TONE).

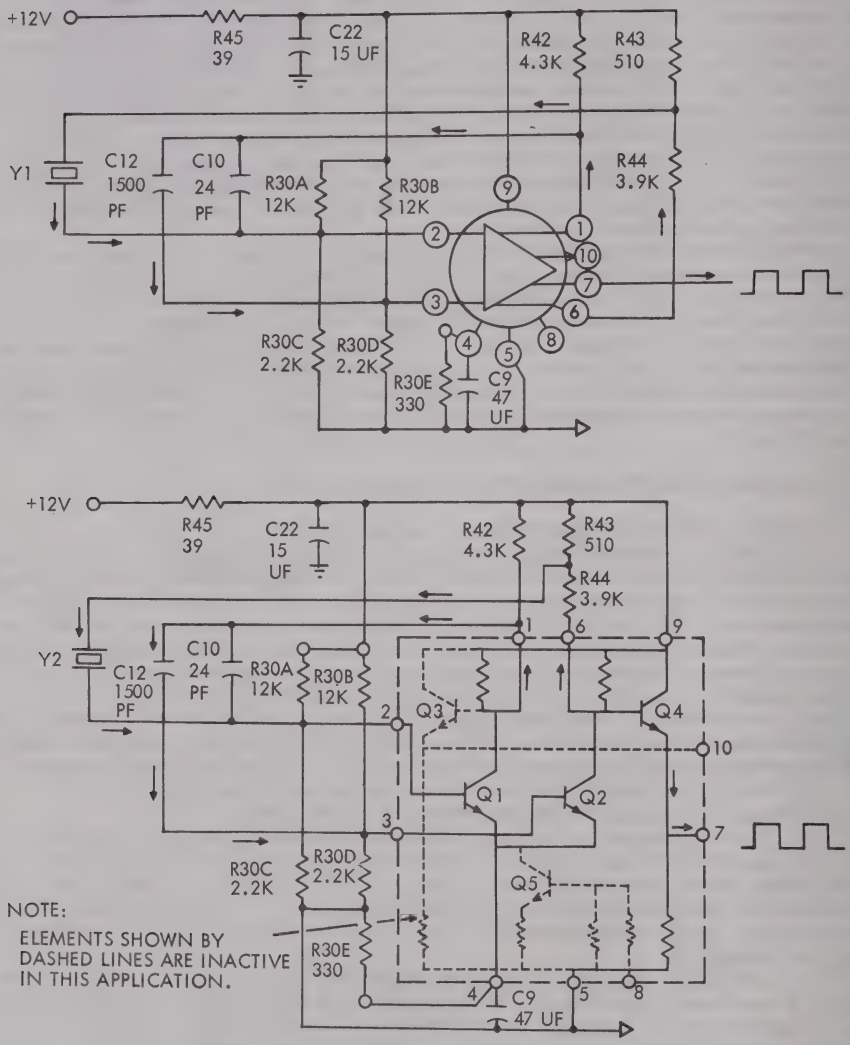


Figure 4-3. Crystal-Controlled Oscillator, Schematic Diagram

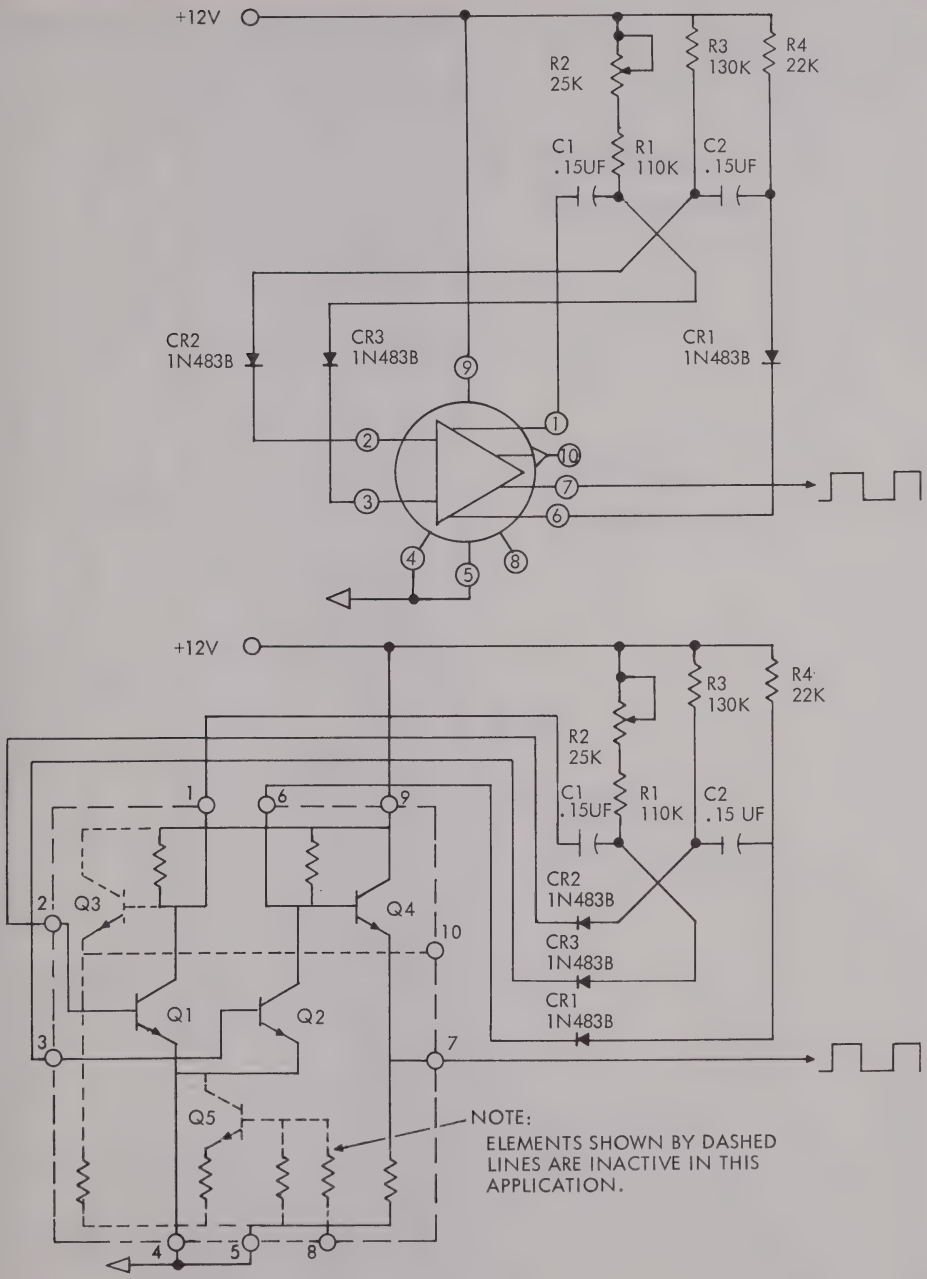


Figure 4-4. Free-Running Multivibrator, Schematic Diagram

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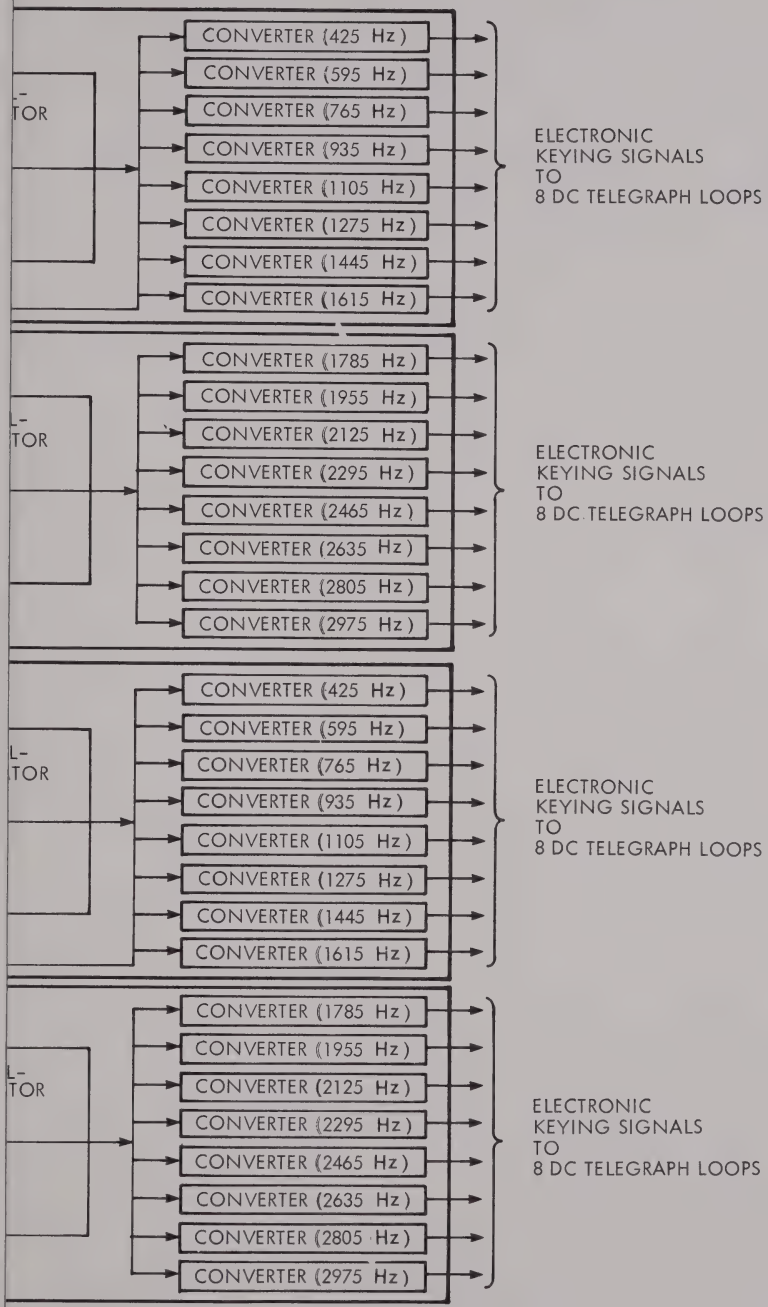

Figure 4-5. Over-All Functional Block Diagram

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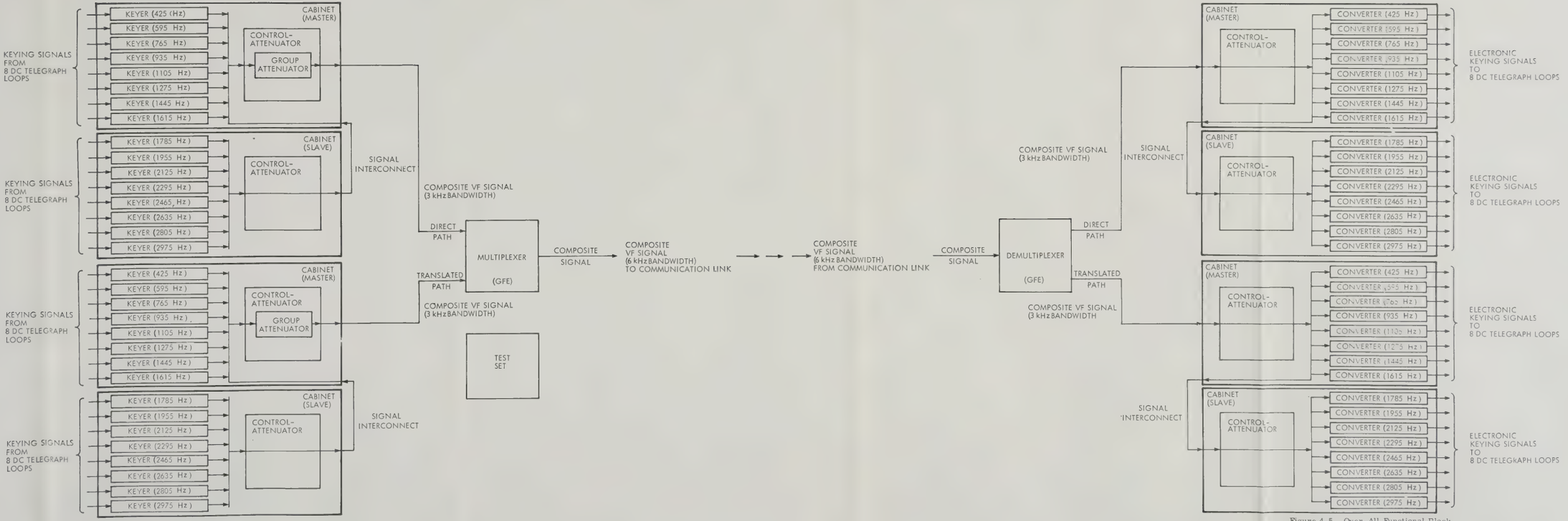
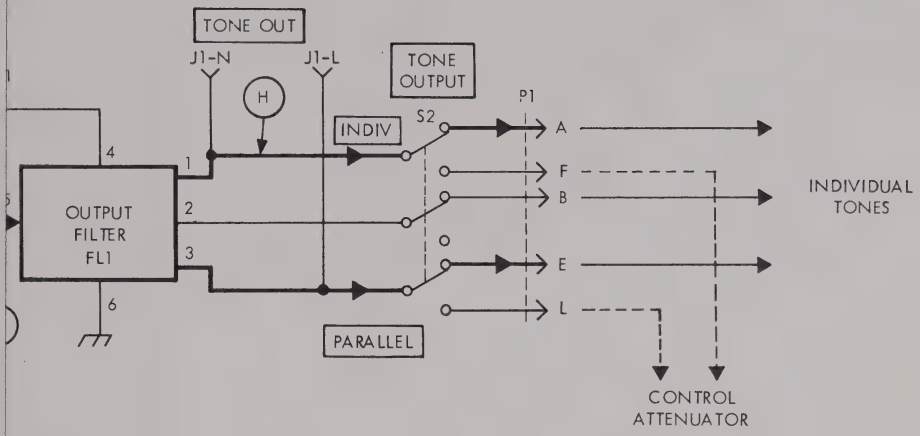


Figure 4-5. Over-All Functional Block Diagram



DIGATE MAIN SIGNAL PATH. LIGHT LINES INDICATE AUXILIARY OR
NAL PATHS.

MBERS OUTSIDE BLOCKS INDICATE PIN CONNECTIONS.

TES EQUIPMENT MARKING.

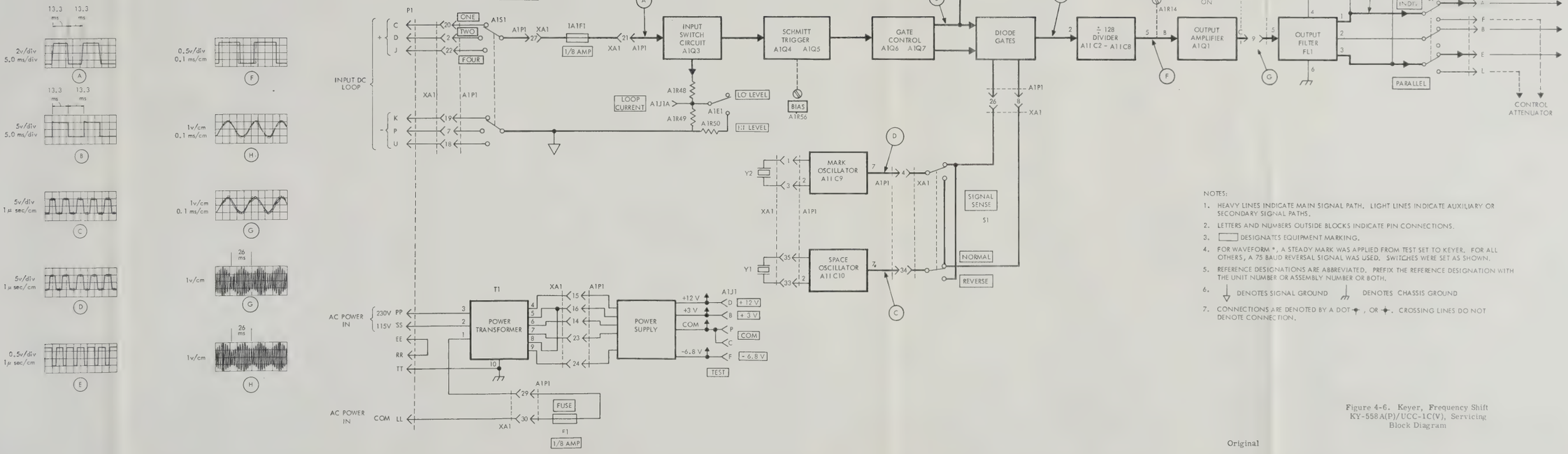
*, A STEADY MARK WAS APPLIED FROM TEST SET TO KEYER. FOR ALL
UD REVERSAL SIGNAL WAS USED. SWITCHES WERE SET AS SHOWN.

GNATIONS ARE ABBREVIATED. PREFIX THE REFERENCE DESIGNATION WITH
R OR ASSEMBLY NUMBER OR BOTH.

IGNAL GROUND DENOTES CHASSIS GROUND

ARE DENOTED BY A DOT , OR . CROSSING LINES DO NOT
CTION.

Figure 4-6. Keyer, Frequency Shift
KY-558A(P)/UCC-1C(V), Servicing
Block Diagram



NOTES:

1. HEAVY LINES INDICATE MAIN SIGNAL PATH. LIGHT LINES INDICATE AUXILIARY OR SECONDARY SIGNAL PATHS.
2. LETTERS AND NUMBERS OUTSIDE BLOCKS INDICATE PIN CONNECTIONS.
3. ▭ DESIGNATES EQUIPMENT MARKING.
4. FOR WAVEFORM *, A STEADY MARK WAS APPLIED FROM TEST SET TO KEYER. FOR ALL OTHERS, A 75 BAUD REVERSAL SIGNAL WAS USED. SWITCHES WERE SET AS SHOWN.
5. REFERENCE DESIGNATIONS ARE ABBREVIATED. PREFIX THE REFERENCE DESIGNATION WITH THE UNIT NUMBER OR ASSEMBLY NUMBER OR BOTH.
6. ⏚ DENOTES SIGNAL GROUND ⏚ DENOTES CHASSIS GROUND
7. CONNECTIONS ARE DENOTED BY A DOT ✦, OR ✦. CROSSING LINES DO NOT DENOTE CONNECTION.

Figure 4-6. Keyer, Frequency Shift KY-558A(P)/UCC-1C(V), Servicing Block Diagram

b. KEYER DIVERSITY COMBINATIONS. - (see figure 4-7)

(1) The cabinet is wired in such a way that the Keyers in specific cabinet stations can be connected in frequency-diversity pairs. These pairs of cabinet stations are: A1 and A2, A3 and A4, A5 and A6, and A7 and A8. The cabinet also is wired in such a way that the Keyers in specific cabinet stations can be connected to obtain four-channel diversity operation. These groups of four cabinet stations are: A1 through A4, and A5 through A8.

(a) With the DIVERSITY switches of the Keyers in the ONE position, each Keyer is connected to a separate input telegraph loop. Turning the DIVERSITY switches of two Keyers in the stations which are wired to form a diversity pair, to the TWO position connects them to the same input telegraph loop. Both channels process the same input telegraph signals. Turning the DIVERSITY switches of the four Keyers in cabinet stations A1 through A4 or in A5 through A8 to FOUR connects the four Keyers to the same input telegraph loop. The DIVERSITY switches of all Keyers in a diversity combination must be in the proper position.

(b) The modules plugged into the two or four stations are selected to form a standard frequency diversity combination. Refer to Table 1-2 for the standard frequency diversity combination.

(2) The signals from the output bandpass filter are applied to the TONE OUTPUT switch. When the switch is set to PARALLEL, it applies the channel output through the Control-Attenuator to the composite tone output line. When the switch is set to INDIV, it applies the channel output directly to the individual tone contacts of the cabinet connector for individual tone output.

c. CONVERTER CIRCUIT DESCRIPTION. - (see figure 4-8)

(1) Either a composite tone signal or an individual tone signal is fed to the input filter FL1, a bandpass filter which blocks all channel frequencies except those of the Converter's channel. The filter also contains the adjustable delay network that provides the means for equalizing delays for diversity operation.

(2) The output of the filter is applied to the attenuator and bias network A1R2. This network provides the AGC attenuation and also biases the input gain-controlled amplifier A1IC1.

(3) The output of A1IC1 is r-c coupled to the input of the second gain-controlled amplifier A1IC3. The gain of both amplifiers is varied by changing the voltage applied to the constant-current generator in the integrated circuit device (see figure 4-1).

(4) The output of the second gain-controlled amplifier is applied to the input of amplifier A11C3 which has fixed gain. The output of A1IC3 is r-c coupled to the limiter stage A1IC4 which clips the signal removing any amplitude-modulated components from the waveform applied to the discriminator.

(5) Transformer A1T1 couples the output of A1IC3 to the gain and level control circuits. The output taken at terminal 4 of A1T1 is rectified and applied to the AGC detector transistor A1Q4. This voltage establishes the conduction level of A1Q4.

(6) The amplified output of A1Q4 is applied to the AGC control amplifier A1Q5 which provides the power gain necessary to drive the gain-controlled stages A1IC1 and A1IC2.

(7) The output taken from terminals 5 and 6 of A1T1 is rectified and filtered by rectifier-filter consisting of diodes A1CR17 through A1CR20 and A1C19, and applied to a compound emitter follower circuit A1Q10-A1Q11. The output of A1Q11 is a d-c voltage proportional to the AGC output level. It is used to limit the amplitude of the drive voltage to the discriminator FL2. In diversity operation, when the gain of the receiver is reduced, the discriminator drive waveform is reduced, assuring that a linear combination of detected signals results in the mark-space detection.

(8) The amplitude-limited output of A1IC4 is applied to the discriminator FL2 which generates a d-c signal of one polarity when the tone signal is at the mark frequency and of the opposite polarity when the tone signal is at the space frequency. The output of the discriminator is added to the bias level supplied by the bias level network and fed through emitter follower A1Q3 to the output level detector A1Q7-A1Q8, a regenerative amplifier. The polarity of the discriminator output connection is determined by the SIGNAL SENSE switch S2.

When the SIGNAL SENSE switch S2 is set to NORMAL, the polarity of the connection is such that the discriminator supplies a positive level when the tone signal is at the mark frequency. With S2 set to REVERSE, the discriminator supplies a negative level to the emitter follower for a mark frequency tone and supplies a positive level to the emitter follower for a space frequency tone.

(9) The regenerative amplifier A1Q7-A1Q8 provides a stable reference for the detection threshold. A negative input cuts off A1Q8 holding the output switch driver A1Q9 in conduction. When

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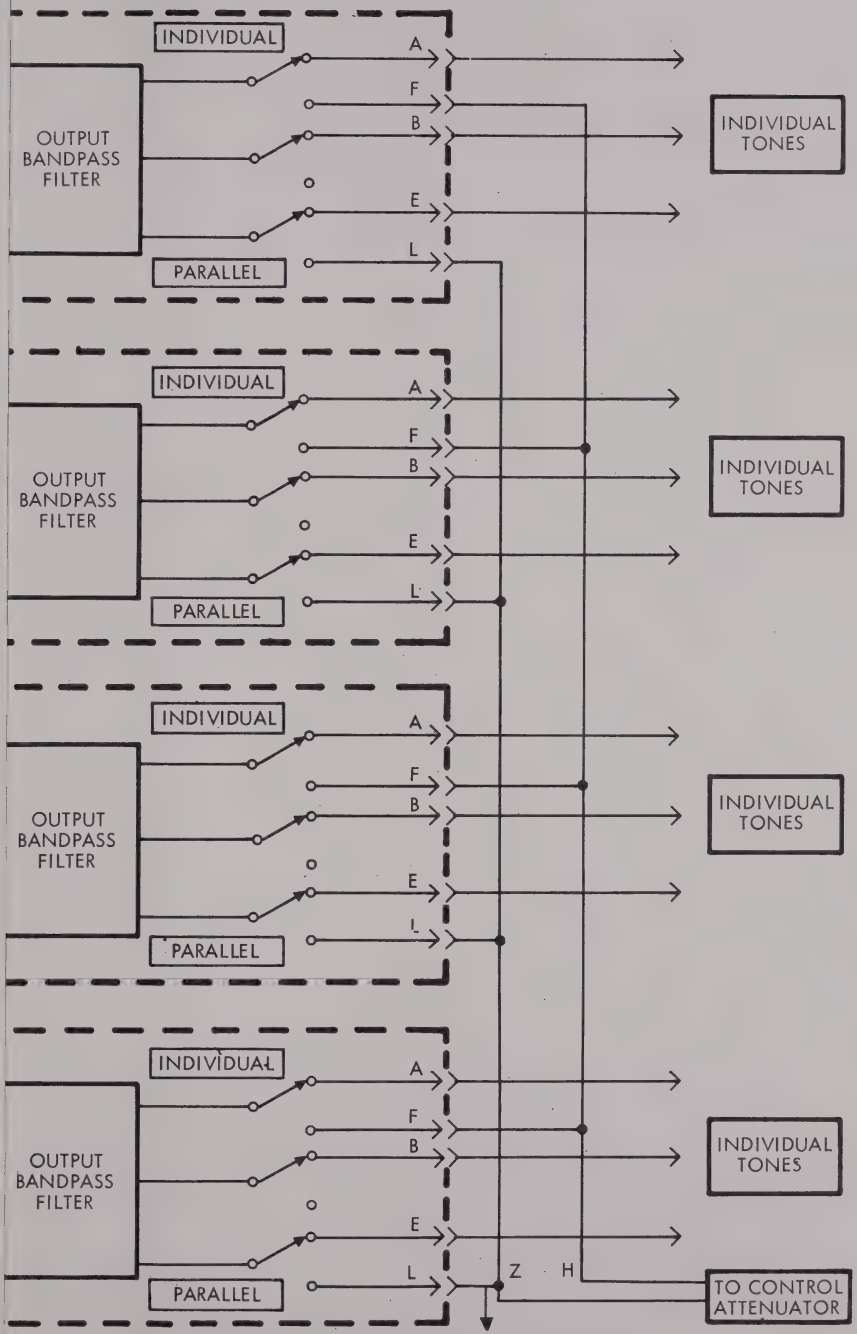

Figure 4-7. Keyer, Diversity Combination, Block Diagram

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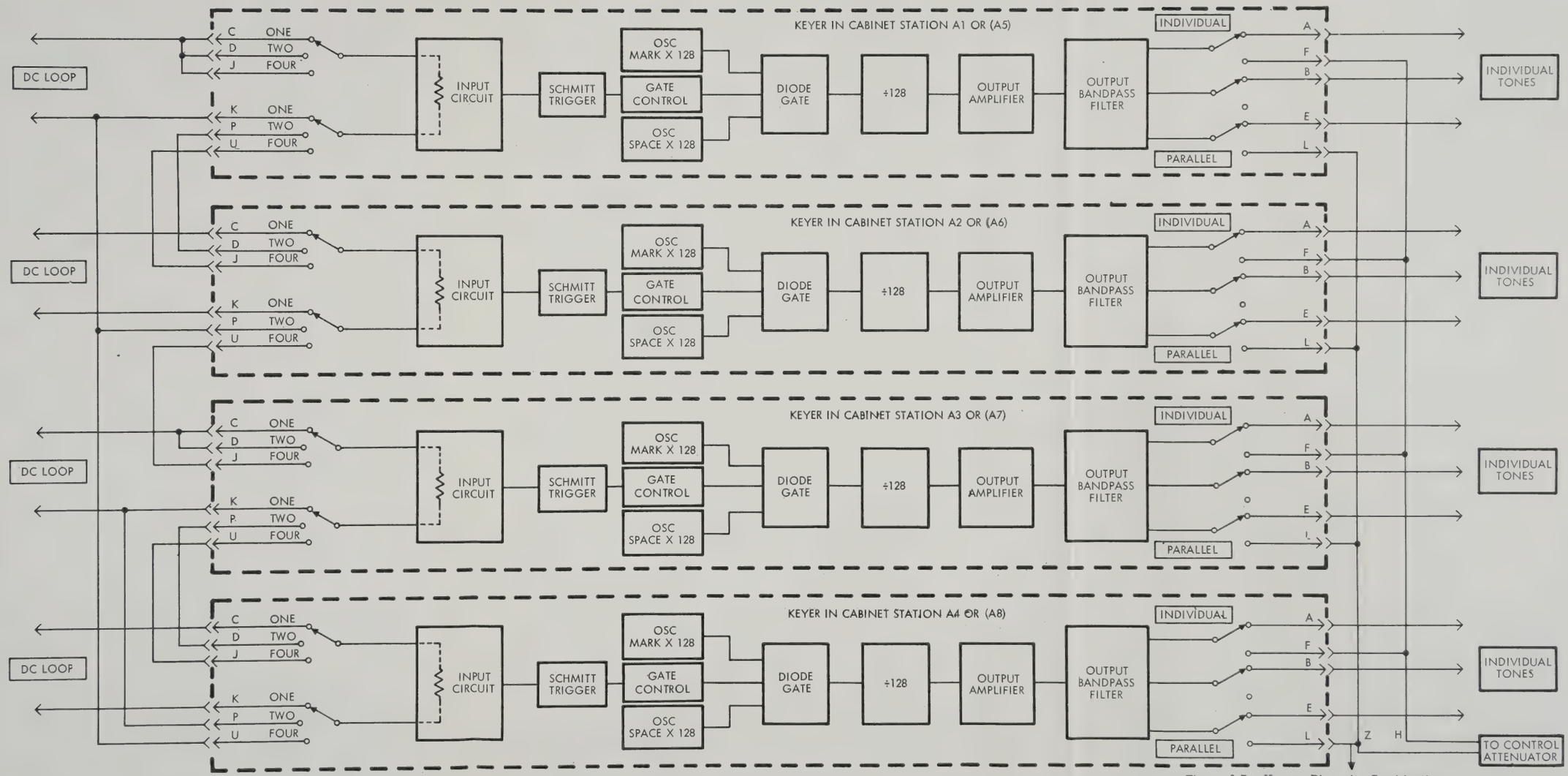


Figure 4-7. Keyer, Diversity Combination, Block Diagram

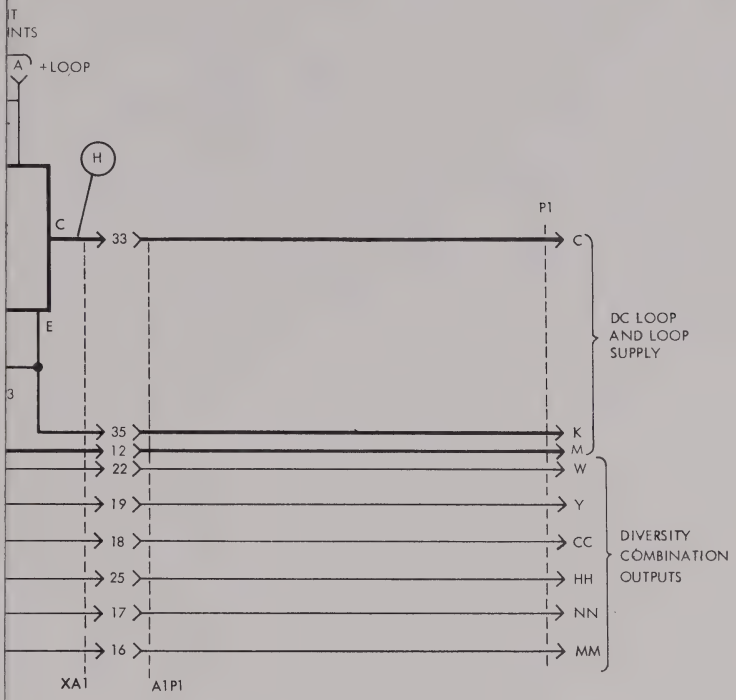
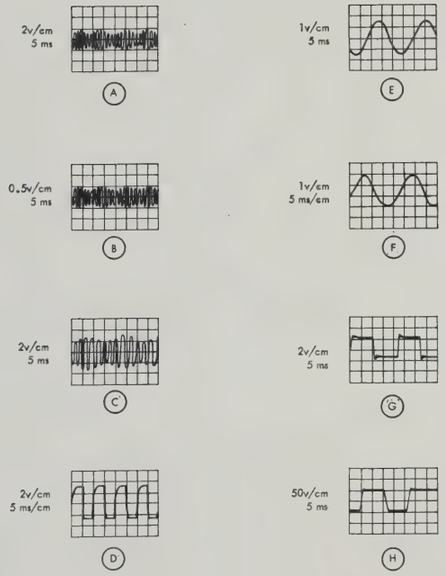
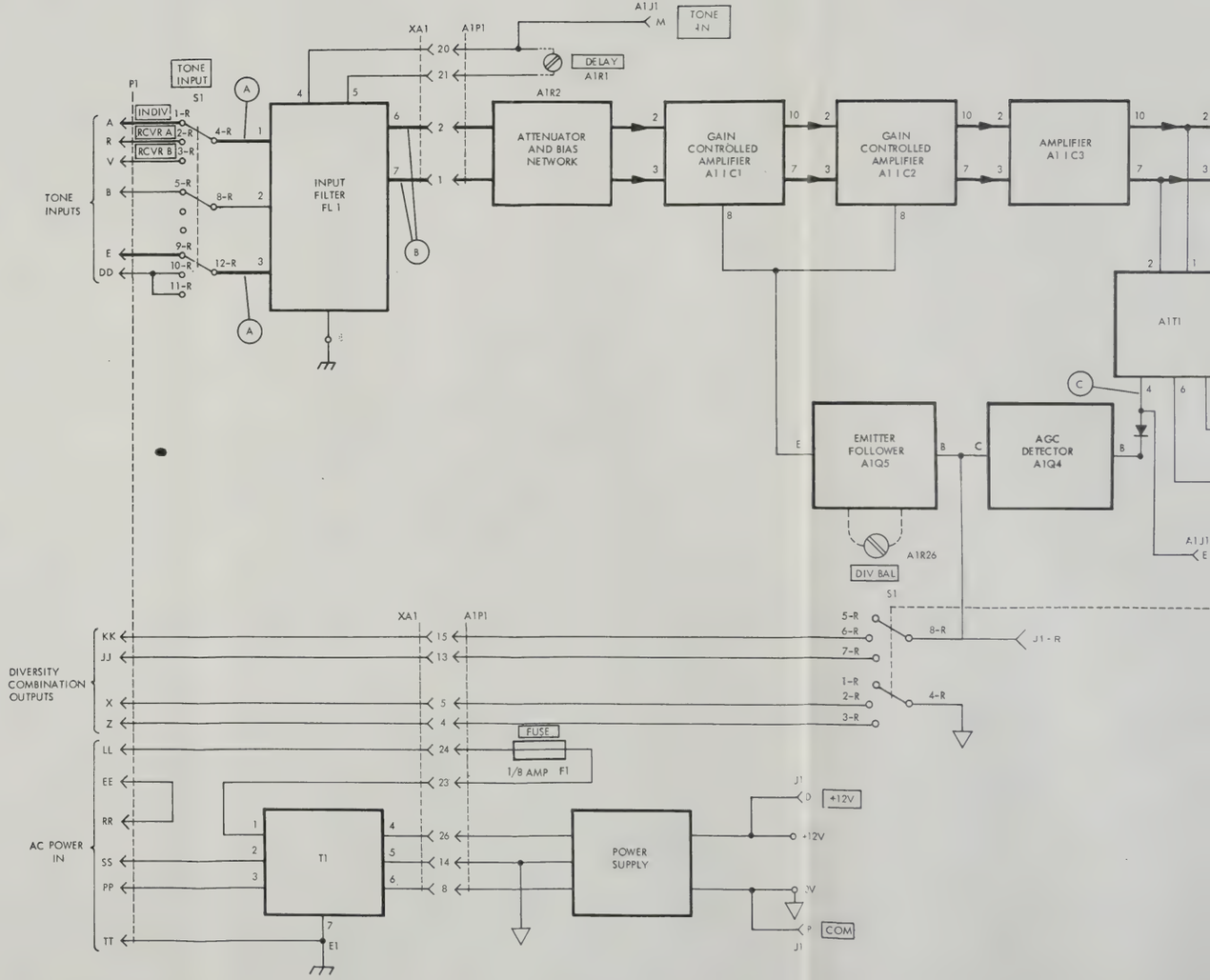
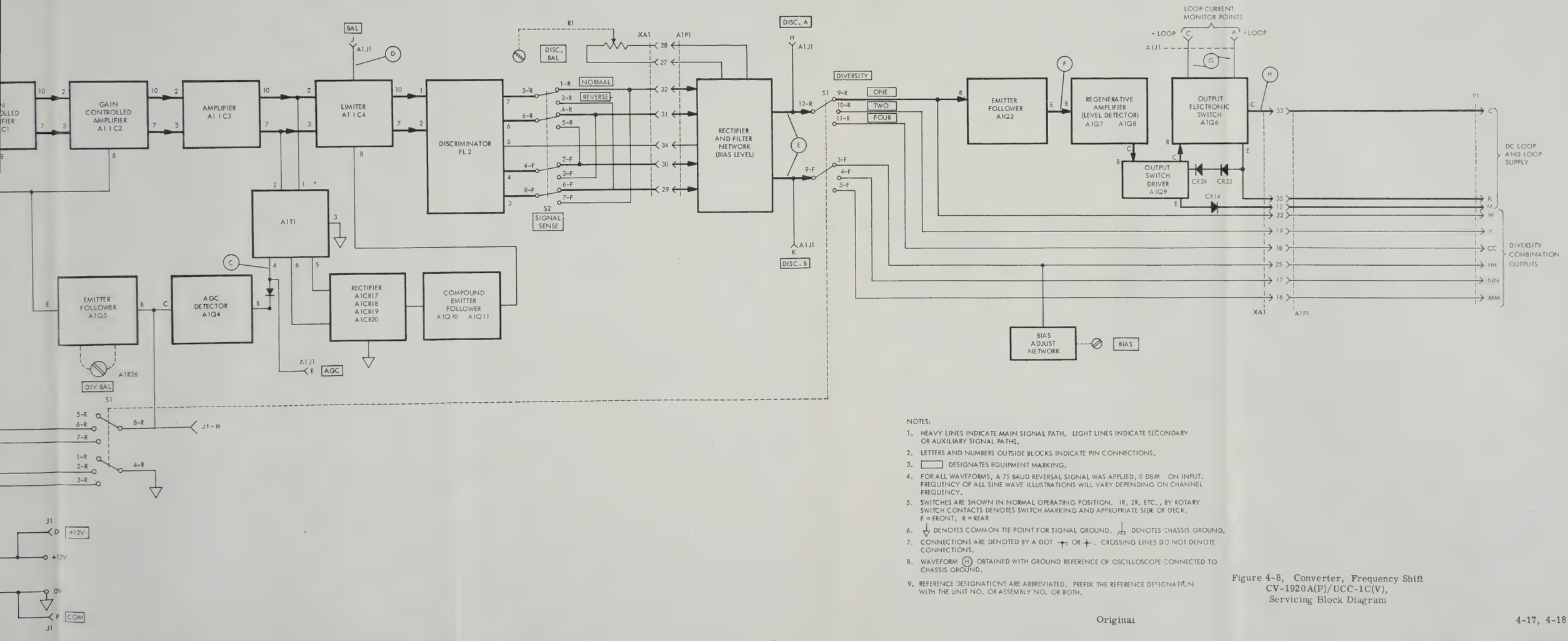


Figure 4-8, Converter, Frequency Shift
CV-1920A(P)/UCC-1C(V),
Servicing Block Diagram


2v/cm
5 ms
A
1v/cm
5 ms
E
0.5v/cm
5 ms
B
1v/cm
5 ms/cm
F
2v/cm
5 ms
C
2v/cm
5 ms
G
2v/cm
5 ms/cm
D
50v/cm
5 ms
H


TONE INPUTS
A
R
V
B
E
DD
TONE INPUT
S1
INDIV
RCVR A
RCVR B
1-R
2-R
3-R
4-R
5-R
8-R
9-R
10-R
11-R
12-R
P1
INPUT FILTER FL1
XA1
A1P1
A1J1
M
TONE 2N
DELAY
A1R1
A1R2
ATTENUATOR AND BIAS NETWORK
GAIN CONTROLLED AMPLIFIER A1IC1
GAIN CONTROLLED AMPLIFIER A1IC2
AMPLIFIER A1IC3
A1T1
EMITTER FOLLOWER A1Q5
AGC DETECTOR A1Q4
A1R26
DIV BAL
S1
J1-R
DIVERSITY COMBINATION OUTPUTS
KK
JJ
X
Z
FUSE
1/8 AMP F1
AC POWER IN
LL
EE
RR
SS
PP
TT
T1
E1
POWER SUPPLY
J1
+12V
COM



NOTES:

1. HEAVY LINES INDICATE MAIN SIGNAL PATH. LIGHT LINES INDICATE SECONDARY OR AUXILIARY SIGNAL PATHS.
2. LETTERS AND NUMBERS OUTSIDE BLOCKS INDICATE PIN CONNECTIONS.
3. ▭ DESIGNATES EQUIPMENT MARKING.
4. FOR ALL WAVEFORMS, A 75 BAUD REVERSAL SIGNAL WAS APPLIED, 0 DBM ON INPUT. FREQUENCY OF ALL SINE WAVE ILLUSTRATIONS WILL VARY DEPENDING ON CHANNEL FREQUENCY.
5. SWITCHES ARE SHOWN IN NORMAL OPERATING POSITION. 1R, 2R, ETC., BY ROTARY SWITCH CONTACTS DENOTES SWITCH MARKING AND APPROPRIATE SIDE OF DECK, F = FRONT, R = REAR
6. ⏚ DENOTES COMMON TIE POINT FOR SIGNAL GROUND. ⏚ DENOTES CHASSIS GROUND.
7. CONNECTIONS ARE DENOTED BY A DOT ⊣⊢ OR ⊣+⊢. CROSSING LINES DO NOT DENOTE CONNECTIONS.
8. WAVEFORM (H) OBTAINED WITH GROUND REFERENCE OF OSCILLOSCOPE CONNECTED TO CHASSIS GROUND.
9. REFERENCE DESIGNATIONS ARE ABBREVIATED. PREFIX THE REFERENCE DESIGNATION WITH THE UNIT NO. OR ASSEMBLY NO. OR BOTH.

Figure 4-8, Converter, Frequency Shift CV-1920A(P)/UCC-1C(V), Servicing Block Diagram

a positive input is applied to A1Q8, A1Q9 is held off. The regenerative action of A1Q7 and A1Q8 assures that the output switch driver A1Q9 is always in either a non-conducting or full conducting condition.

(10) The output switch driver A1Q9 controls output switch A1Q6, which determines loop current flow

(a) When neutral output is used the loop supply is connected to the Converter through pins C and K of connector P1. When A1Q9 is not conducting, output switch A1Q6 conducts and loop current flows. When A1Q9 is conducting, output switch A1Q6 is held off and presents a high impedance so that no loop current flows.

(b) If polar output is used, the external loop supply is connected through pins C,K, and M of P1. Output switch A1Q6 will allow positive polar loop voltage to flow through it from P1-C to P1-K when it is turned on by output switch driver A1Q9. When the Converter is used in this polar configuration, the emitter of output switch driver A1Q9 is biased by the negative loop supply voltage through diode CR14. When a negative signal input is applied to A1Q8, output switch driver 1A1Q9 will allow negative polar loop voltage to flow from P1-M to P1-K through CR14, A1Q9, CR24, and CR23.

d. CONVERTER DIVERSITY COMBINATIONS – (see figure 4-9)

The two factors which determine diversity connections are switch settings on the individual Converters and Cabinet positions (stations) occupied by the Converters. Because Cabinet wiring for stations A1 through A4 is identical to that for stations A5 through A8, figure 4-9 illustrates only one four-station group.

(1) Referring to figure 4-9, each channel, regardless of the station into which it is plugged, can be connected to an associated individual input transformer within the input filter FL1, or to either of two composite input transformers (designated as RCVR A and RCVR B) within the input filter. The two composite input lines are used in the frequency-diversity/space-diversity system shown in figure 1-7. In this system, two Converter modules are assigned to each channel. One group of four Converters (for the eight channels) processes signals from radio receiver A, which appear on the RCVR A input line: the other group of four Converters processes signals from radio receiver B, which are furnished on the RCVR B input line. With the TONE INPUT switches set as shown, the Converters in stations A1 and A3 are connected to receiver A and the Converters in stations A2 and A4 are connected to receiver B: the converters in stations A1 and A3 function as a frequency-diversity pair, and those in stations A2 and A4 function as a frequency-diversity pair, those in A1 and A2 function as a space-diversity pair, and those in A3 and A4 function as a space-diversity pair. For example, the Converters in the first two stations might be 425-Hz channels: those in A3 and A4 would be 1785-Hz channels; thereby forming a narrow-band, frequency-diversity/space-diversity combination (Table 1-2). In this combination, outputs of the four channel discriminators are added in series and applied between the bias network and the emitter-follower input to the regenerative amplifier of the Converter in station A1. This can be verified by tracing the path through the DIVERSITY switches on figure 4-9, which are shown in the FOUR position. In order to combine the outputs of all four channels, the circuit grounds of the four channels must be tied together. This function is performed through one bank of the DIVERSITY switch and cabinet wiring.

(2) To use the Converters in stations A1 through A4 as two separate frequency-diversity pairs, the DIVERSITY switch on each Converter must be set to TWO and the Converters must be rearranged (see Table 1-2). For example, the Converters used in stations A1 through A4, respectively, might be 425-Hz, 1785-Hz, 595-Hz, and 1955-Hz channels, the first two and the last two functioning as narrow-band frequency-diversity pairs.

(a) With the DIVERSITY switches of the four Converters set to TWO:

1 Discriminator outputs of the modules in stations A1 and A2 are placed in series between the bias network and the input to the regenerative amplifier of the Converter in Station A1.

2 Discriminator outputs of the modules in stations A3 and A4 are placed in series between the bias network and the input to the regenerative amplifier of the Converter in station A3.

3 The grounds of the Converters in stations A1 and A2 are tied together as are the grounds of the Converters in stations A3 and A4.

(b) Since no space-diversity pairs are involved, all four of the TONE INPUT switches are set to the same position so that all four Converters are connected to the same composite tone line.

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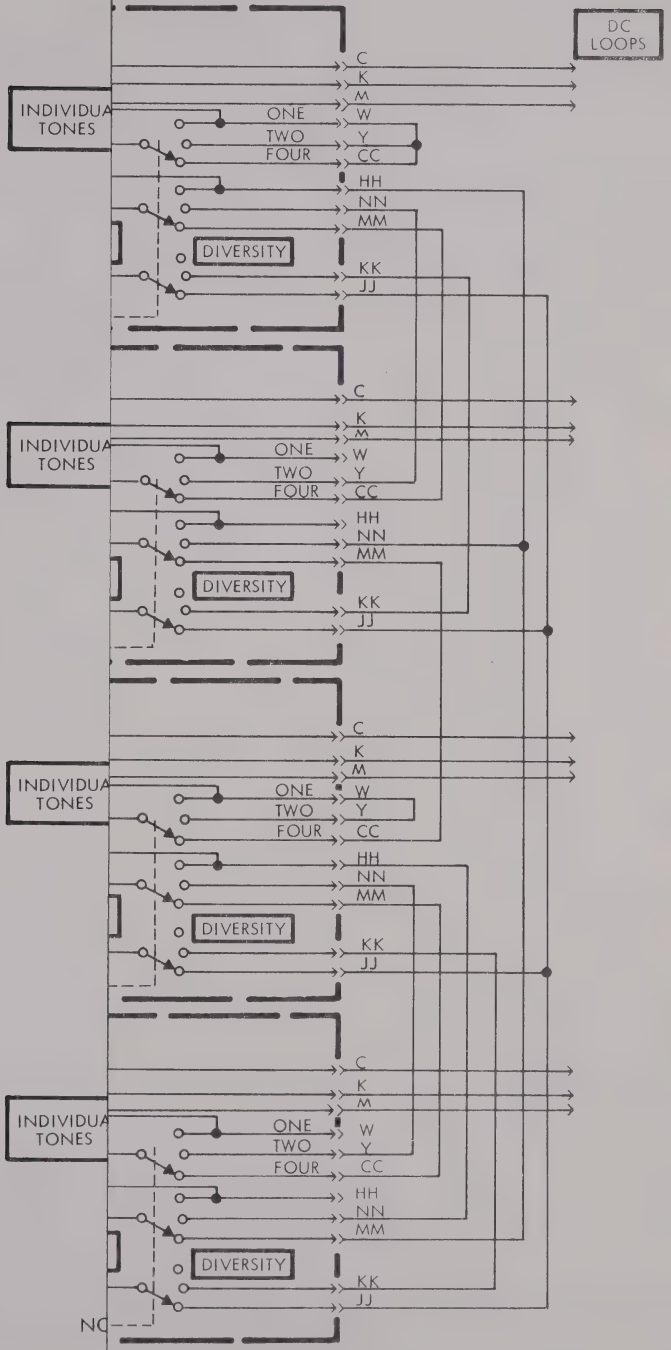
Figure
4-9



er Diversity Combination,
k Diagram

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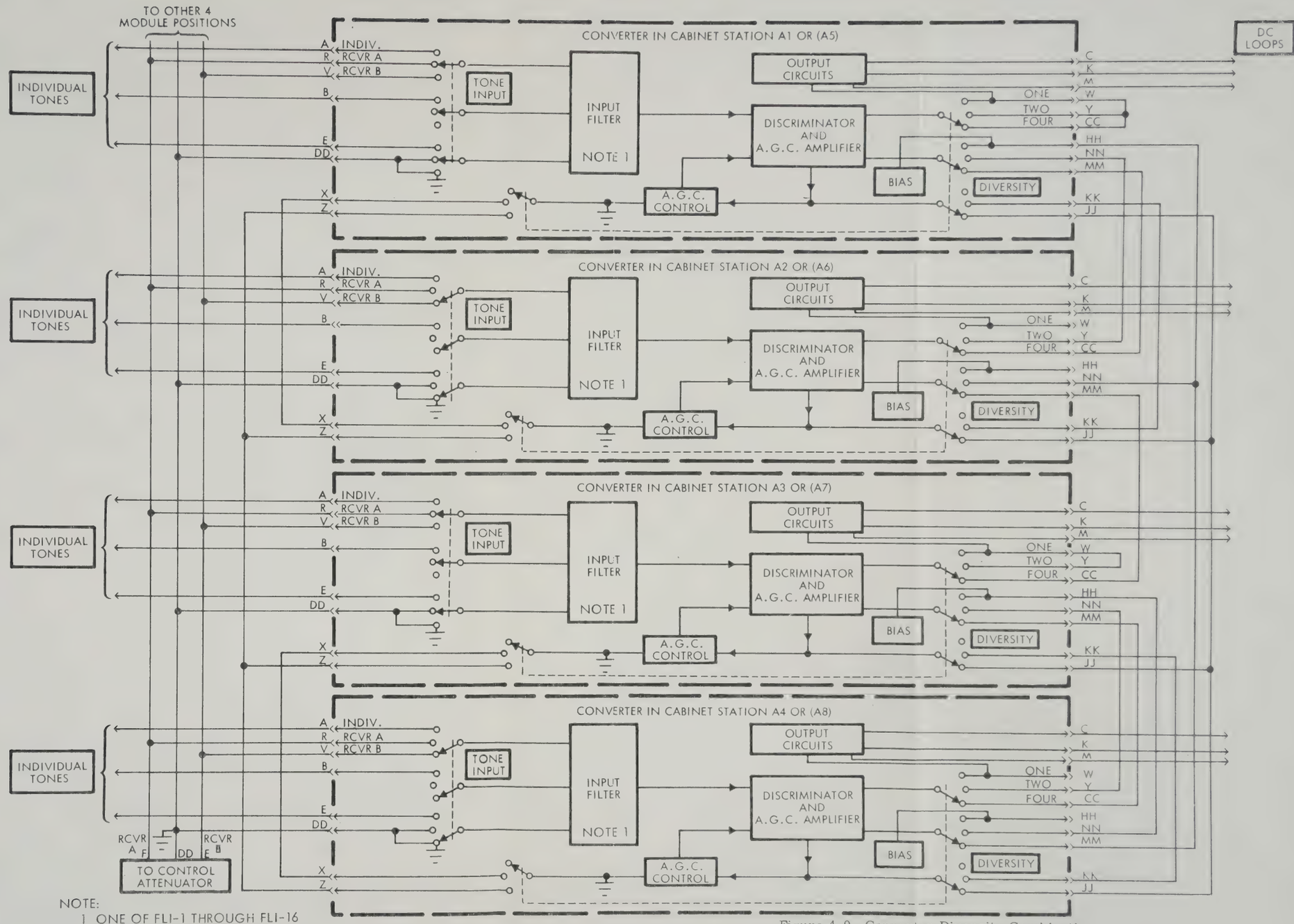

Figure 4-9. Converter Diversity Combination, Block Diagram

(3) The composite input lines are connected to the composite-tone lines in the cabinet through the MODE switches on the Control-Attenuator, and the composite-tone lines are connected to the INTERCONNECT A and INTERCONNECT B connectors. The composite-tone lines are connected to the corresponding lines in other Cabinets when more than one Cabinet is used; in this case, the MODE switch is set to MASTER in one of the Cabinets and to SLAVE in each of the other Cabinets. The tone inputs are then received through the input transformers in the Cabinet which has the MODE switch set to MASTER. For example, in the system shown in figure 1-7, which employs four Cabinets containing Converters, the input lines of the top Cabinet and of the third Cabinet from the top are used.

(4) Each Converter can be set to operate individually as a receiving channel by turning the DIVERSITY switch on the module to ONE. Each Converter can be connected to an individual input line by setting the TONE INPUT switch on the module to INDIV.

(5) Figure 4-9 illustrates the intermediate AGC circuit connections for diversity operation. Notice that these connections are made through another bank of the DIVERSITY switch.

When a group of Converters is used in a diversity combination, the inputs to the AGC control amplifiers of all modules in the group are connected together. This common connection is at the collector of the AGC detector 1A2A1Q4 of each module. The Converter receiving the strongest input signal produces the most negative output from the AGC detector. This signal overrides those of the other Converters and drives all AGC control amplifiers in the group. The AGC control amplifiers of all Converters in the group are driven by the AGC signal of the Converter receiving the strongest input signal. This causes the discriminator drive signals of all Converters except the one with the strongest input signal to be attenuated with respect to the discriminator drive signal of the Converter receiving the strongest input signal. Thus, only the strongest input signal produces sufficient discriminator output to drive the regenerative amplifier (output level detector) A1Q7-A1Q8 and the output switch A1Q6.

e. CONTROL-ATTENUATOR CIRCUIT DESCRIPTION. - (see figure 4-10)

(1) When the Keyer TONE OUTPUT switches are in the PARALLEL position, the signals are combined and applied to the input transformer, T1, of the Control-Attenuator through the MODE switch. The output signal from T1 is applied to the input attenuation and bias network A1R2. The attenuation of this network is sufficient to provide the operating range for amplifiers A1IC1 and A1IC2. The network also biases the input gain-controlled amplifier A1IC1.

(2) The output of A1IC1 is r-c coupled to the input of the fixed-gain amplifier A1IC2. The output of A1IC2 is transformer coupled to the output amplifier A1Q2. It is also transformer coupled, through terminals 4 and 6 of A1T1, rectified by A1CR1 and A1CR2, and applied to the base of the AGC detector transistor A1Q1B. Because the voltage required to cause this transistor to conduct is essentially constant, it serves as a reference to determine (detect) the level of the output signal from the fixed-gain amplifier A1IC2.

(3) The amplified output of A1Q1A is applied to the base of emitter follower A1Q1B which functions as a power amplifier with sufficient gain to control the output of the gain-controlled amplifier A1IC1.

(4) The output of A1T1 (terminal 6) is also applied to the base of the output power amplifier A1Q2. The LEVEL control A1R8 varies the output level by adjusting the level of the signal applied to the base of A1Q2. The signals from the power amplifier are coupled out of the Control-Attenuator by output transformer T2 which is located in the rear chassis assembly.

(5) Transformers T3 and T4 are the RCVR A and RCVR B isolation transformers. When signals are applied to their inputs, and when the MODE switch is in the MASTER position, the input signals are applied to the RCVR A and RCVR B lines for application to the Converter inputs.

(6) The 115 VAC/230 VAC switch on the front panel of the Control-Attenuator controls the application of power to the other modules in the Cabinet. When the switch is in the 115 VAC position, the input voltage is applied across the 115-volt input terminals of all power transformers; when the switch is in the 230 VAC position, the input voltage is applied across the full primary windings of all power transformers. Pin RR must be connected to Pin SS on all cabinet stations in the enclosure when operating on 115V. Pin RR must be connected to Pin PP on all cabinet stations in the enclosure when operating on 230V. (See figure 5-8.)

f. TEST SET CIRCUIT DESCRIPTION. - (see figure 4-11)

The Test Set consists of a reversals generator, a tone generator, an audio amplifier and loudspeaker, a meter, switches to control operation, and a power supply circuit. The FUNCTION SELECTOR switch is the primary control of Test Set operation. It determines the connection and

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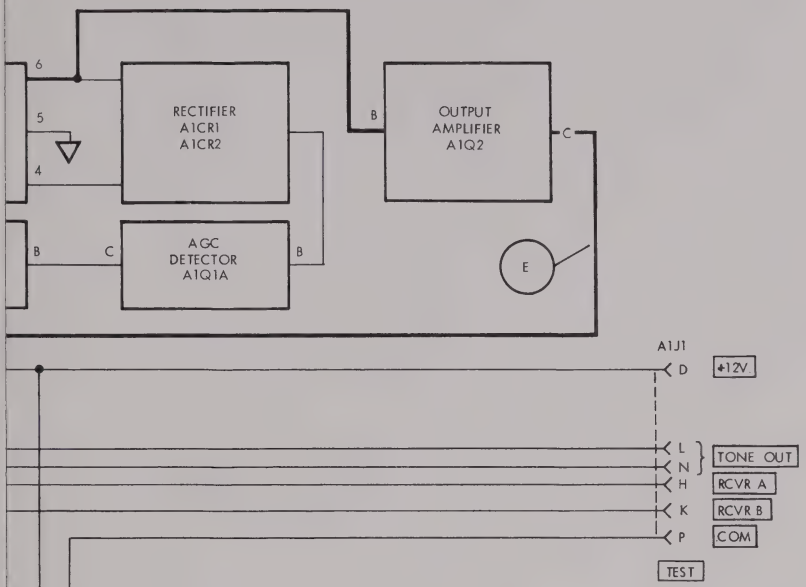

NOTES:

1. HEAVY LINES INDICATE MAIN SIGNAL PATH. LIGHT LINES INDICATE SECONDARY OR AUXILIARY SIGNAL PATHS.
2. LETTERS AND NUMBERS OUTSIDE BLOCKS INDICATE PIN CONNECTIONS.
3. ▭ DESIGNATES EQUIPMENT MARKING.
4. FOR ALL WAVEFORMS, A 1000 HERTZ SINE WAVE, 0 DBM LEVEL, WAS APPLIED TO THE INPUT. OUTPUT WAS ADJUSTED FOR 0 DBM OUT INTO A 600 OHM LOAD.
5. REFERENCE DESIGNATIONS ARE ABBREVIATED. PREFIX THE REFERENCE DESIGNATION WITH THE UNIT NUMBER OR ASSEMBLY NUMBER OR BOTH.
6. ⏚ DENOTES SIGNAL GROUND ⏚ DENOTES CHASSIS GROUND
7. CONNECTIONS ARE DENOTED BY A DOT ⊕ OR ⊢⊣. CROSSING LINES DO NOT DENOTE CONNECTION.
8. SWITCHES ARE SHOWN IN NORMAL OPERATING POSITION. 1R, 2R, ETC, BY ROTARY SWITCH CONTACTS DENOTES SWITCH MARKINGS AND APPROPRIATE SIDE OF DECK. F=FRONT, R=REAR

Figure 4-10. Control-Attenuator C-6554A/UCC-1C(V), Servicing Block Diagram

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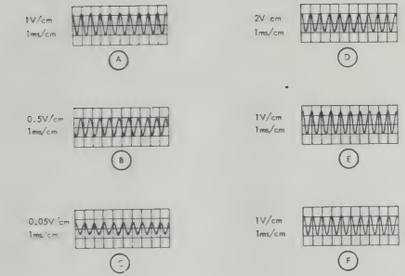


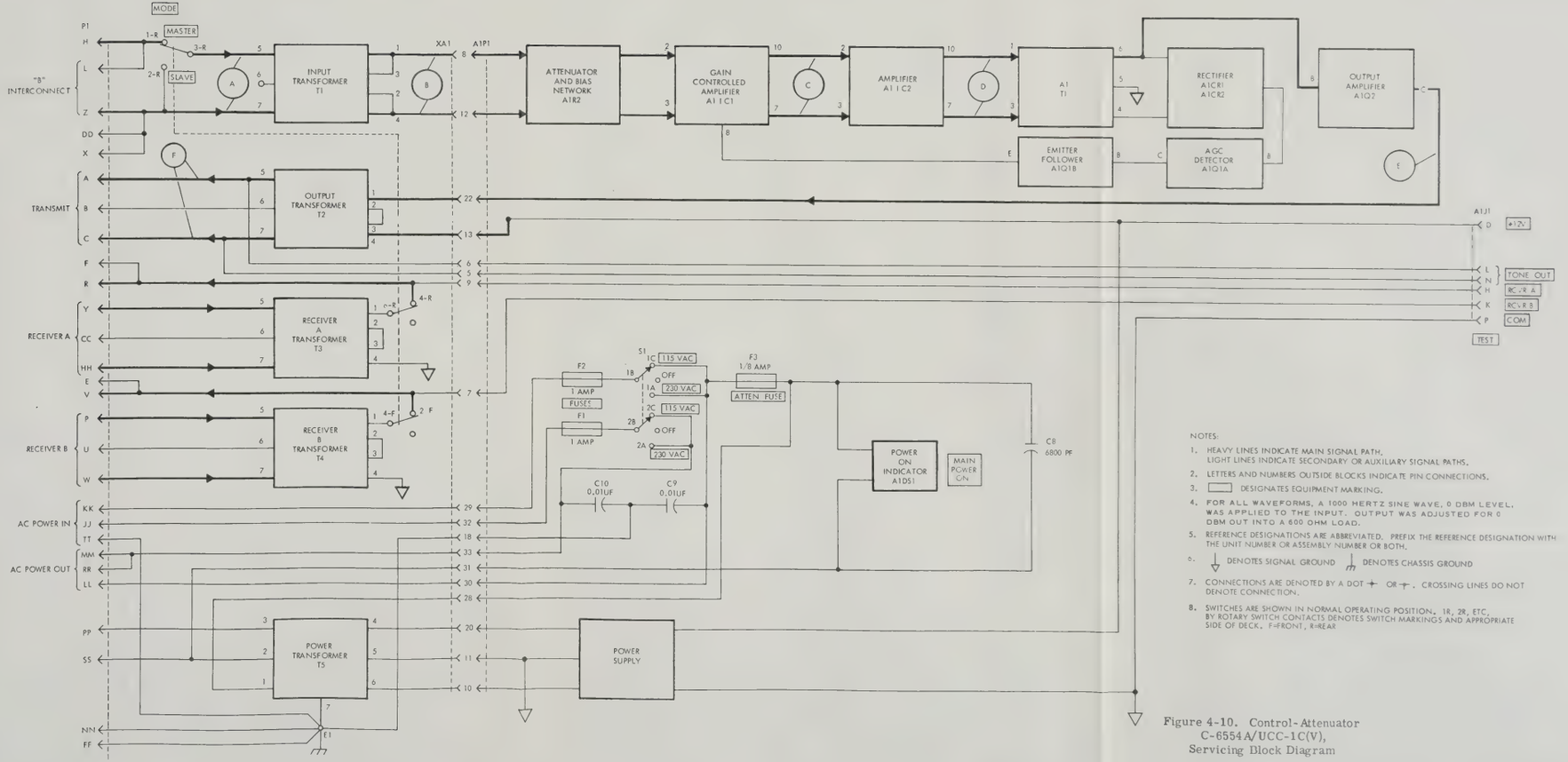
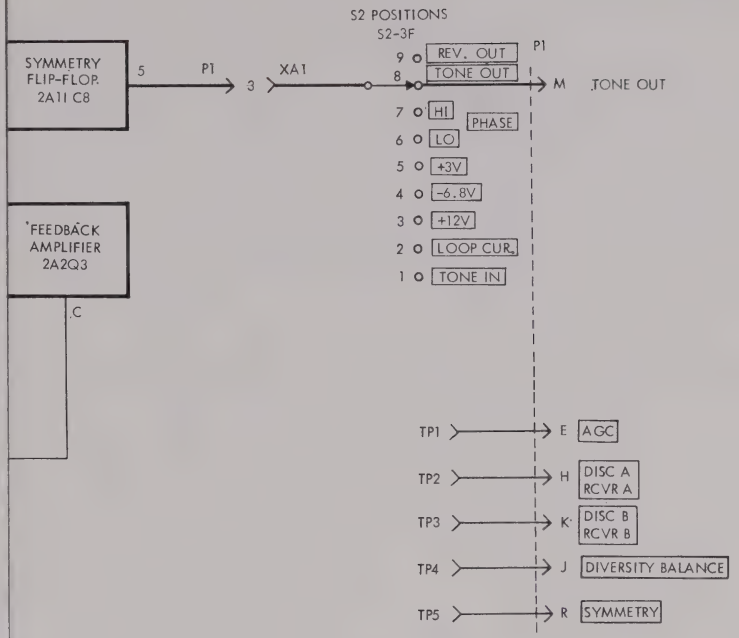

MODE
MASTER
SLAVE
"B" INTERCONNECT
TRANSMIT
RECEIVER A
RECEIVER B
AC POWER IN
AC POWER OUT
INPUT TRANSFORMER T1
OUTPUT TRANSFORMER T2
RECEIVER A TRANSFORMER T3
RECEIVER B TRANSFORMER T4
POWER TRANSFORMER T5
ATTENUATOR AND BIAS NETWORK A1R2
GAIN CONTROLLED AMPLIFIER A1 1C1
AMPLIFIER A1 1C2
A1 T1
RECTIFIER A1CR1 A1CR2
OUTPUT AMPLIFIER A1Q2
EMITTER FOLLOWER A1Q1B
AGC DETECTOR A1Q1A
POWER SUPPLY
POWER ON INDICATOR A1DS1
MAIN POWER ON
F2 1 AMP FUSES
F1 1 AMP
F3 1/8 AMP ATTEN FUSE
S1
115 VAC
230 VAC
OFF
C8 6800 PF
C10 0.01UF
C9 0.01UF
A1J1
+12V
TONE OUT
RCVR A
RCVR B
COM
TEST
NOTES:
1. HEAVY LINES INDICATE MAIN SIGNAL PATH. LIGHT LINES INDICATE SECONDARY OR AUXILIARY SIGNAL PATHS.
2. LETTERS AND NUMBERS OUTSIDE BLOCKS INDICATE PIN CONNECTIONS.
3. DESIGNATES EQUIPMENT MARKING.
4. FOR ALL WAVEFORMS, A 1000 HERTZ SINE WAVE, 0 DBM LEVEL, WAS APPLIED TO THE INPUT. OUTPUT WAS ADJUSTED FOR 0 DBM OUT INTO A 600 OHM LOAD.
5. REFERENCE DESIGNATIONS ARE ABBREVIATED. PREFIX THE REFERENCE DESIGNATION WITH THE UNIT NUMBER OR ASSEMBLY NUMBER OR BOTH.
6. DENOTES SIGNAL GROUND DENOTES CHASSIS GROUND
7. CONNECTIONS ARE DENOTED BY A DOT + OR +. CROSSING LINES DO NOT DENOTE CONNECTION.
8. SWITCHES ARE SHOWN IN NORMAL OPERATING POSITION. 1R, 2R, ETC, BY ROTARY SWITCH CONTACTS DENOTES SWITCH MARKINGS AND APPROPRIATE SIDE OF DECK, F-FRONT, R-REAR

Figure 4-10. Control-Attenuator C-6554A/UCC-1C(V), Servicing Block Diagram



DES OF CRYSTAL

LIGHT LINES INDICATE AUXILIARY

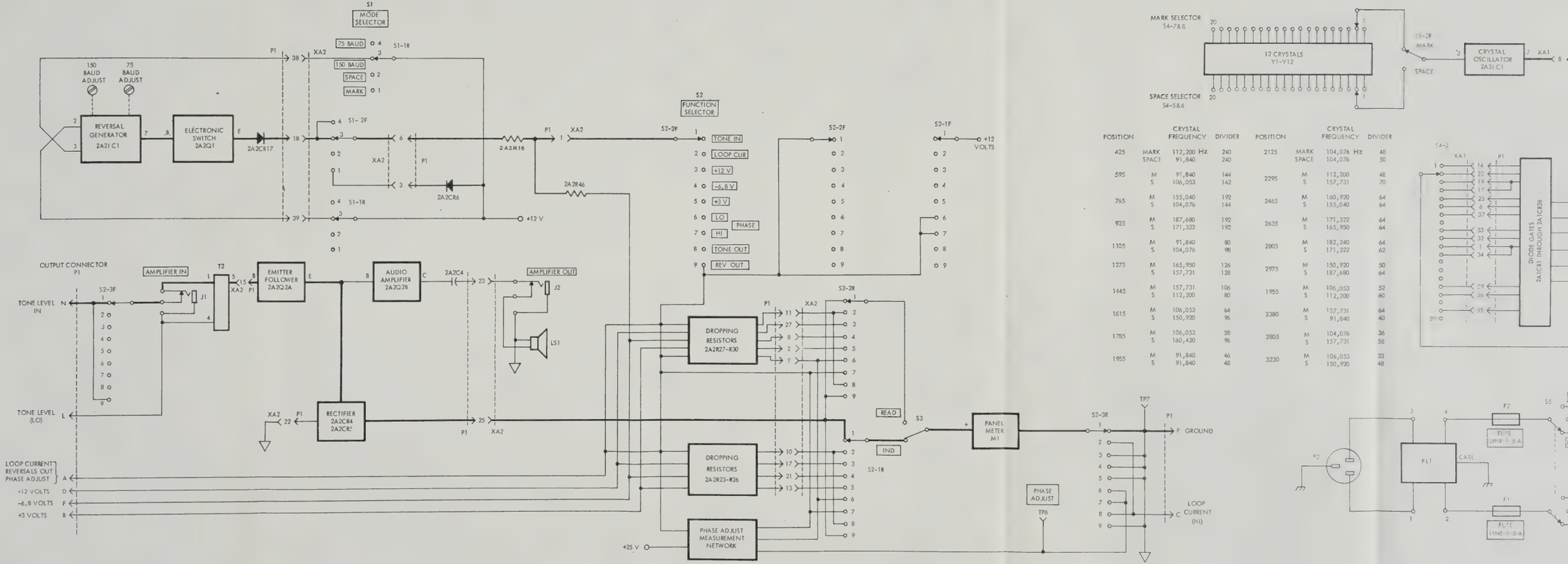
CTIONS.

L GROUND. ⏚ DENOTES CHASSIS GROUND.

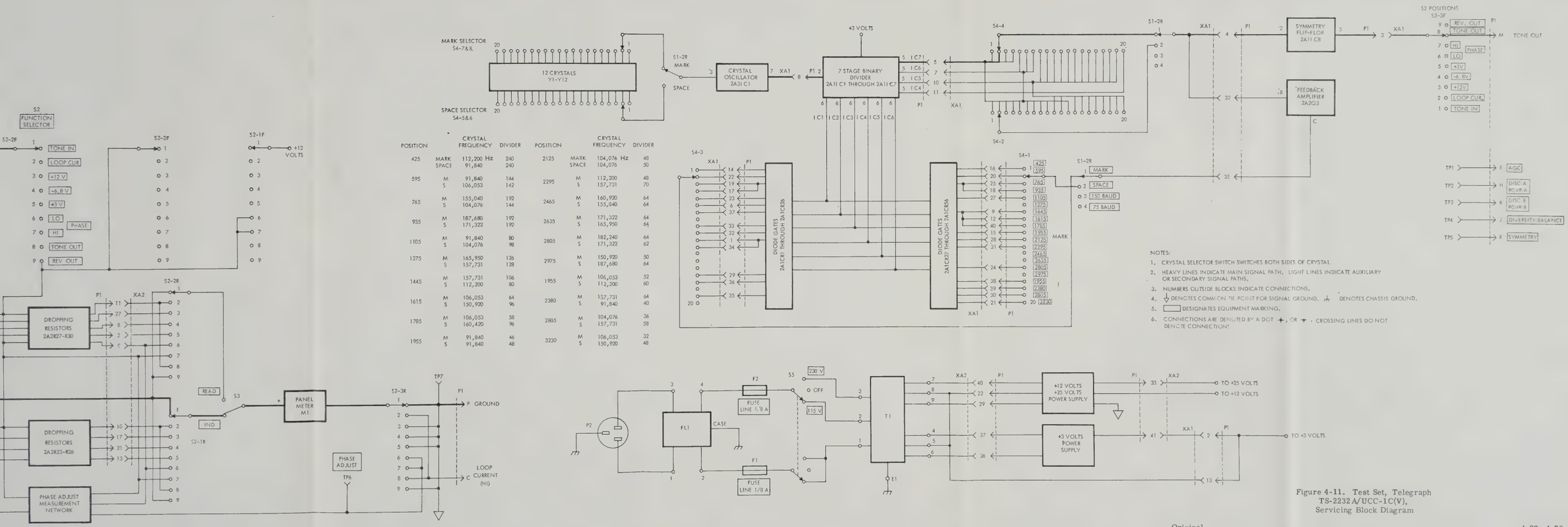
OR ✦ . CROSSING LINES DO NOT

TO +3 VOLTS

Figure 4-11. Test Set, Telegraph TS-2232A/UCC-1C(V), Servicing Block Diagram



POSITION		CRYSTAL FREQUENCY	DIVIDER	POSITION		CRYSTAL FREQUENCY	DIVIDER
425	MARK	112,200 Hz	240	2125	MARK	104,076 Hz	48
	SPACE	91,840	240		SPACE	104,076	50
595	M	91,840	144	2295	M	112,200	48
	S	106,053	142		S	157,731	70
765	M	155,040	192	2465	M	160,920	64
	S	104,076	144		S	155,040	64
935	M	187,680	192	2635	M	171,322	64
	S	171,322	192		S	165,950	64
1105	M	91,840	80	2805	M	182,240	64
	S	104,076	98		S	171,322	62
1275	M	165,950	126	2975	M	150,920	50
	S	157,731	128		S	187,680	64
1445	M	157,731	106	1955	M	106,053	52
	S	112,200	80		S	112,200	60
1615	M	106,053	64	2380	M	157,731	64
	S	150,920	96		S	91,840	40
1785	M	106,053	58	2805	M	104,076	36
	S	160,420	96		S	157,731	58
1955	M	91,840	46	3230	M	106,053	32
	S	91,840	48		S	150,920	48



POSITION		CRYSTAL FREQUENCY	DIVIDER	POSITION		CRYSTAL FREQUENCY	DIVIDER
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	SPACE	91,840	240		SPACE	104,076	50
595	M	91,840	144	2295	M	112,200	48
	S	106,053	142		S	157,731	70
765	M	155,040	192	2465	M	160,920	64
	S	104,076	144		S	155,040	64
935	M	187,680	192	2635	M	171,322	64
	S	171,322	192		S	165,950	64
1105	M	91,840	80	2805	M	182,240	64
	S	104,076	98		S	171,322	62
1275	M	165,950	126	2975	M	150,920	50
	S	157,731	128		S	187,680	64
1445	M	157,731	106	1955	M	106,053	52
	S	112,200	80		S	112,200	60
1615	M	106,053	64	2380	M	157,731	64
	S	150,920	96		S	91,840	40
1785	M	106,053	58	2805	M	104,076	36
	S	160,420	96		S	157,731	58
1955	M	91,840	46	3230	M	106,053	32
	S	91,840	48		S	150,920	48

NOTES:

1. CRYSTAL SELECTOR SWITCH SWITCHES BOTH SIDES OF CRYSTAL.
2. HEAVY LINES INDICATE MAIN SIGNAL PATH. LIGHT LINES INDICATE AUXILIARY OR SECONDARY SIGNAL PATHS.
3. NUMBERS OUTSIDE BLOCKS INDICATE CONNECTIONS.
4. ⏚ DENOTES COMMON TIE POINT FOR SIGNAL GROUND. ⏚ DENOTES CHASSIS GROUND.
5. ▭ DESIGNATES EQUIPMENT MARKING.
6. CONNECTIONS ARE DENOTED BY A DOT (+), OR (+ ·) CROSSING LINES DO NOT DENOTE CONNECTION.

Figure 4-11. Test Set, Telegraph TS-2232 A/UCC-1C(V), Servicing Block Diagram

routing of input and output signals. Because, in various positions, it functions with the various circuits in the Test Set, these positions will be discussed with the circuits they affect.

(1) REVERSALS GENERATOR. - The reversals generator consists of a free-running multivibrator driving a transistor switch output circuit. The active element of the multivibrator is an integrated circuit differential amplifier 2A2IC1 (see paragraph 4-3c). The MODE SELECTOR switch S1 determines the mode of operation of the reversals generator, controlling the timing circuitry and providing loop closure to pins A and P of the test connector P1. The positions of S1 and the functions of the reversals generator are as follows:

(a) 75 BAUD, the reversals generator runs at 75 baud as determined by R2.
(b) 150 BAUD, the reversals generator runs at 150 baud as determined by R1.
(c) MARK, S1 closes the loop through CR6.
(d) SPACE, S1 opens the loop.

The reversals generator provides a low-level polar output when the Keyer's LO-HI selector (A1E1) is installed in the LO position. When the selector is in the HI position, neutral output is provided. The reversals output is available at the test connector only when the FUNCTION SELECTOR is in the REV. OUT position.

(2) TONE GENERATOR. - The tone generator consists of crystal-controlled oscillator 2A3IC1 (see paragraph 4-3b), 12 frequency control crystals, eight integrated circuit flip-flops (2A1IC1 through 2A1IC8) (see paragraph 4-2d), and a feedback circuit consisting of pulse amplifier 2A2Q3 and diodes 2A1CR1 through 2A1CR56.

Seven of the eight integrated circuit flip-flops make up a variable seven-stage counter (count down or frequency divider) circuit. The function of the eights stage (2A1IC8) is slightly different from the others; it functions as a frequency divider with a symmetrical output. The frequency division is changed by the TONE SELECTOR switch as required to obtain the correct frequency for the channel selected. Refer to the schematic diagrams of the Test Set, figures 5-13 through 5-15.

The variable seven-stage counter functions in the following manner. The first four stages 2A1IC1 through 2A1IC4 are always in the circuit. Switching determines whether the output is taken from stage four, five, six or seven. Feedback from the output stage is applied to previous stages to alter the count. For example, take the case in which the total frequency division required is 240. The symmetry flip-flop 2A1IC8 divides the counter output by two, so the counter must divide the oscillator frequency by 120. The seven-stage counter divides by 128 when no feedback is used. A feedback numeral count of eight must be added to cause the counter to divide by 120. This is accomplished by applying the feedback to the fourth stage 2A1IC4. Other counting combinations are obtained by switching, which changes the output stage and the feedback combination. Table 4-1 presents the crystal and feedback combinations for all tones. In each combination, the feedback is applied through feedback amplifier 2A2Q3 and steering diodes 2A1CR1 through 2A1CR56.

A number of the frequencies (tones generated by the Test Set)differ slightly from the actual mark and space frequencies. This difference is the result of using frequency division to generate more than one tone from one crystal oscillator frequency. For example, the frequency of 2Y2 (91.840kHz)can be divided by 144 to obtain a frequency of 637.8 Hz, or by 80 to obtain a frequency of 1148 Hz. Although the output tones of the Test Set are not at the exact frequencies of channel marks and spaces, they are within the tolerances necessary to align the AN/UCC-1D(V).

(a) The TONE SELECTOR switch S4 connects two crystals (one for the space frequency, the other for the mark frequency) into the tone generator circuit. Twenty channel frequencies from 425 Hz to 3230 Hz are available upon command on the TONE SELECTOR switch. Since each channel has both a mark frequency and a space frequency, a total of 40 frequencies must be derived from the 12 crystals. The TONE SELECTOR switch also alters the configuration of the network of feedback diodes to cause the flip-flop counter to produce the required mark and space frequencies.

(b) The MODE SELECTOR switch (in MARK or SPACE position) connects one of the two crystals, selected by the TONE SELECTOR switch, into the oscillator circuit, at one time. If the MODE SELECTOR switch is in either 75 BAUD or 150 BAUD position, both mark and space crystals are removed from the oscillator circuit.

(c) The tone outputs are connected to pins M and P of the test connector P1 when the FUNCTION SELECTOR switch is in the TONE OUT position.

TABLE 4-1. CRYSTAL FREQUENCIES AND COUNTER FEEDBACK COMBINATIONS

FREQUENCY		CRYSTAL AND FREQUENCY (Hz)	DIVISION	OUTPUT F/F	FEEDBACK TO F/F NUMBERS	OUTPUT FREQUENCY (Hz)
425	Mark	Y1 112,200	240	7	4	467.5
	Space	Y2 91,840	240	7	4	382.7
595	Mark	Y2 91,840	144	7	4, 5, 6	637.8
	Space	Y7 106,053	192	7	6	552.5
765	Mark	Y3 155,040	192	7	6	807.5
	Space	Y4 104,076	144	7	4, 5, 6	722.8
935	Mark	Y12 187,680	192	7	6	977.5
	Space	Y10 171,322	192	7	6	892.3
1105	Mark	Y2 91,840	80	6	4, 5	1148.0
	Space	Y4 104,076	98	6	4, 3, 2, 1	1062.5
1275	Mark	Y5 165,950	126	6	1	1317.1
	Space	Y6 157,731	128	6	-	1232.3
1445	Mark	Y6 157,731	106	6	4, 2, 1	1488.2
	Space	Y1 112,200	80	6	4, 5	1402.5
1615	Mark	Y7 106,053	64	5	-	1657.0
	Space	Y9 150,920	96	6	5	1572.0
1785	Mark	Y7 106,053	58	5	2, 1	1828.5
	Space	Y8 160,420	92	6	5, 2	1743.7
1955	Mark	Y2 91,840	46	5	4, 1	1996.5
	Space	Y2 91,840	48	5	4	1913.3
2125	Mark	Y4 104,076	48	5	4	2168.2
	Space	Y4 104,076	50	5	3, 2, 1	2081.5
2295	Mark	Y1 112,200	48	5	4	2337.5
	Space	Y6 157,731	70	6	5, 4, 3, 1	2253.3
2465	Mark	Y9 106,420	64	5	-	2506.5
	Space	Y3 155,040	64	5	-	2422.5
2635	Mark	Y10 177,322	64	5	-	2676.9
	Space	Y5 165,950	64	5	-	2592.9
2805	Mark	Y11 182,240	64	5	-	2847.5
	Space	Y10 171,322	62	5	1	2763.2
2975	Mark	Y8 150,920	50	5	3, 2, 1	3018.4
	Space	Y12 187,680	64	5	-	2932.5
1955	Mark	Y7 106,053	52	5	3, 2	2039.6
	Space	Y1 112,200	60	5	2	1870.0
2380	Mark	Y6 157,731	64	5	-	2464.5
	Space	Y2 91,840	40	5	4, 3	2296.0
2805	Mark	Y4 104,076	36	5	4, 3, 2	2891.0
	Space	Y6 157,731	58	5	2, 1	2719.5
3230	Mark	Y7 106,053	32	4	-	3314.1
	Space	Y8 150,920	48	5	4	3144.5

(3) AUDIO AMPLIFIER AND LOUDSPEAKER. - Tone signals applied across pins N and L of the test connector are connected to input transformer T2 when the FUNCTION SELECTOR switch is in the TONE IN position. The input transformer drives audio amplifier 2A2Q2B through emitter follower 2A2Q2A. The output of the audio amplifier 2A2Q2B is capacitively coupled by 2A2C4 to the loudspeaker LS1 and also to AMPLIFIER OUT jack J2. This arrangement provides an audible indication of the presence and keying of signals through the loudspeaker or earphones. Tone signals also may be applied to the AMPLIFIER IN jack J1. In this case, the audible signals are available at LS1 or earphones connected to J2 with the FUNCTION SELECTOR switch in any position.

(4) METER CIRCUITS. - The meter and associated circuits perform a variety of functions as selected by the FUNCTION SELECTOR switch. The mode of operation of the meter M1 is determined by the READ-IND. switch S3. When S3 is in the READ position, the parameters selected by the FUNCTION SELECTOR switch are measured in terms of volts, milliamperes, and dbm. When S3 is in the IND. position, the meter provides a go-no go indication with a passing range as indicated in paragraph 3-2a(4).

(a) TONE LEVEL MEASUREMENT. - The tone input to audio-amplifier 2A2Q2B from emitter follower 2A2Q2A is also applied to a rectifier consisting of 2A2CR4 and 2A2CR5. When the FUNCTION SELECTOR switch is set to TONE IN, the rectified signal is applied to the meter. The TONE IN measurement is used for equalizing the output tone levels of the individual channels.

(b) VOLTAGE MEASUREMENTS. - The d-c supply voltages in the modules may be measured by turning the FUNCTION SELECTOR switch to the +12V, -6.8V, and +3V positions. This connects the meter M1 between pins D and P, F and P, or B and P of the test connector through dropping resistors. When the READ/IND switch is in IND position a go-no go indication is obtained; when it is in READ position the meter indicates the actual value in volts.

CAUTION

Do not attempt to measure low-level polar-loop current with the Test Set. Damage to the meter will result.

(c) LOOP CURRENT MEASUREMENT (HI-neutral operation only). - When the FUNCTION SELECTOR switch is turned to the LOOP CUR. position, the meter indicates neutral loop current. Each module contains a resistor in series with the d-c loop. The voltage which is proportional to loop current is applied to pins A and C of the TEST connector of the module. This voltage is coupled through the test connector of the Test Set, dropping resistor, and the LOOP CUR. contacts of the FUNCTION SELECTOR switch, to the meter.

(d) DELAY ADJUSTMENT. - The phase angles of the channel signals applied to pin A of the test connector and to the PHASE ADJ test point are compared by a delay comparison network. The d-c component of the output of this network is proportional to the difference in phase of the input signals and dependent in polarity upon which channel has the greater delay. The output of the delay comparison network is applied to meter M1 through the FUNCTION SELECTOR switch when it is set to PHASE LO or PHASE HI. The delays of the two channels may be equalized by adjusting the modules to obtain a zero indication on the meter. Phase adjustment waveforms are shown in figure 4-12. The present Converter adjustment procedure does not use this feature of the Test Set.

4-5. LOGICAL TROUBLESHOOTING.

System troubles may be located by progressive substitution or elimination of modules and units. Initially, the Keyer and Converter Cabinets of the Telegraph Terminal should be disconnected from the communications link and connected together. The sending loops of the station are then used to key the receiving loops of the station through the Telegraph Terminal. By substitution and elimination, the trouble is isolated to the Cabinet, to one of the Keyers, Converters, or Control-Attenuators, or to a cable. At the module level, trouble is isolated to the printed-circuit card or to the module frame, by card substitution.

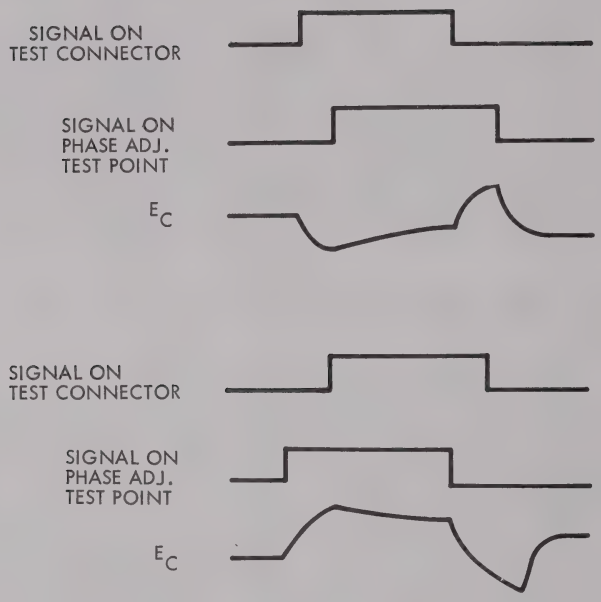

Figure 4-12. Phase Adjustment Measurement Network Waveforms

Note

A basic assumption of system troubleshooting is that either the Keyer or the Converters are known to be operating normally. This implies that trouble is encountered in either transmission or reception but not in both simultaneously.

4-6. TEST EQUIPMENT.

The test equipment required for troubleshooting the Telegraph Terminal include the Oscilloscope and ME-6( ) called out in Table 1-5, as well as Multimeter AN/PSM-4( ), hereafter referred to as the Multimeter.

4-7. SYSTEM TROUBLESHOOTING.

a. PRELIMINARY CHECK. - Apply power to the equipment, and perform the following steps in sequence.

(1) Check that all Cabinets are receiving power as indicated by MAIN POWER indicator lamp in Control-Attenuators.

(2) If any MAIN POWER indicator is not lighted, check fuses on that Control-Attenuator. Replace defective fuse(s). If any fuse blows again, do not replace until short-circuit has been found and eliminated.

(3) If trouble affects a single channel, check the fuse on the module. Replace the fuse, if defective; if fuse blows again, do not replace it until the short-circuit has been found and eliminated.

(4) Disconnect the Telegraph Terminal from the communication link and connect the PARALLEL TONE XMIT jacks of the Keyer Cabinets to the PARALLEL TONES RCVR jacks of the Converter Cabinets to which inputs from the communication link were applied.

(5) Key the receiving loops from the sending loops through the Telegraph Terminal.

(6) If step (5) is:

(a) Successful, the trouble is in the communication link, at the opposite end of the link, or in the cable eliminated by the test connections made in step (4); turn off the power, disconnect the Telegraph Terminal from the test setup, and check external equipment, as required.

(b) Not successful, proceed to the procedures for isolating trouble to a module in paragraph b, below. Do not disconnect the Telegraph Terminal from the test setup.

b. ISOLATING TROUBLE TO A MODULE. -

(1) GENERAL. - To isolate trouble to a Telegraph Terminal module, proceed in the sequence described below.

(a) Perform the operator's maintenance detailed in paragraph 3-3.

(b) Check the test-point voltage levels as described in (2) below.

(c) If the voltage-level checks are satisfactory, but the equipment continues to malfunction, proceed to the procedures provided in (3) below. (A Test Set malfunction may be isolated to a section by determining which of its normal functions the Test Set fails to perform. To isolate the trouble to a stage or part, refer to paragraph c below.) The locations of test points referred to in the following procedures are shown in figures 2-15 through 2-17 and 5-1 through 5-7. Waveforms for the Telegraph Terminal are illustrated on the aprons of the servicing block diagrams. (See figure 4-7, 4-9, 4-11 and 4-12.)

(2) VOLTAGE CHECKS. - For each Telegraph Terminal module, check for the correct voltage levels, which are listed in Table 4-2.

(a) If the signal at a test point is a d-c voltage, make the measurement with the multimeter, if it is an a-c waveform, use the oscilloscope. Each waveform listed calls out the figure (waveforms are shown on the aprons) that illustrates the correct waveform. Switch settings required to obtain the correct waveform are shown in the figure.

(b) If the voltage levels or waveforms are not correct, the module is faulty. Proceed to paragraph c below, for further troubleshooting instructions.

(c) If the voltage levels and waveforms are correct but the equipment continues to malfunction, refer to Table 4-3 which identifies types of trouble and specifies, for each, the appropriate troubleshooting procedure.

TABLE 4-2. TEST POINT VOLTAGE LEVELS

UNIT	TEST POINT	CORRECT VOLTAGE
Keyer	+LOOP, -LOOP	Voltage drop resulting from loop current flowing through 47-ohm resistor
		60-ma neutral 0 - +3.0V square wave
		±6V polar, ±6V square wave
		20-ma neutral 0 to +1.0V square wave
	+3V, COM	+3V, -10, +15 percent
	-6.8V, COM	-6.8V, ±10 percent
	+12V	+12V, ±10 percent
	TONE OUT, TONE OUT	A-C waveform, see figure 4-6
	BIAS	A-C waveform, see figure 4-6
Converter	+LOOP, -LOOP	Voltage drop resulting from loop current flowing through 47-ohm resistor
		60-ma neutral 0 to +3.0 V square wave
	+12V, COM	+12V, ±10 percent
	AGC	A-C waveform, see figure 4-8
	DISC A	A-C waveform, see figure 4-8
	DISC B	A-C waveform, see figure 4-8
Control-Attenuator	+12V, COM	+12V, ±10 percent
	TONE OUT, TONE OUT	A-C waveform, see figure 4-10

TABLE 4-3. SYSTEM TROUBLES

TYPE OF TROUBLE	REFER TO TABLE 4-4 TROUBLE NUMBER
Keying not successful on any channel	1
Receiving not successful on any channel	2
Keying not successful on any channel (eight channel cabinet)	3
Receiving not successful on any channel (eight channel cabinet)	4
Trouble limited to single diversity combination	5, 6
Trouble limited to a single tone channel	7

c. ISOLATING TROUBLE TO A STAGE AND PART. -

(1) When trouble has been isolated to a circuit card by means of the procedures in paragraphs 4-7a and b, isolate the trouble to the stage and part by monitoring signal levels and d-c levels on that card.

(2) Signal waveforms are shown on the aprons of the servicing block diagrams. In general, amplitudes should be within 20 percent of those shown. However, this is based on locally applied inputs at nominal levels. When the input to the Converter is being received from the opposite end of a communication link, it may be down by as much as -40 db, with a corresponding decrease in the amplitude of the waveform. The appearance of the carrier in the Keyer and Converter waveforms depends on the channel frequency being monitored.

(3) Location of a component in a unit can be found in figures 2-15 through 2-17 and 5-1 through 5-7. Location of a component in a circuit is shown in figures 5-9 through 5-15. Figures 5-16 through 5-19 show the response curves of Telegraph Terminal filters.

(4) The Keyer and Converter waveforms were taken on channel modules. Test points which do not have waveforms have only d-c levels. Refer to Table 4-2 for the voltages at these jacks.

(5) Typical integrated circuit and transistor voltages for the circuit cards are listed in Tables 4-5 through 4-7. Voltage measurements should be within 10 percent of listed values except for the control voltage on pin 8 of IC1 and IC2 in the Converter. This voltage varies from +2.5 to +10.5 volts depending on input signal strength. All measurements were made with respect to circiutry ground using the Multimeter. Input conditions where pertinent, are noted in the Tables.

TABLE 4-4. TELEGRAPH TERMINAL, TYPICAL TROUBLES

TROUBLE	TEST	CORRECTION
1. Keying not successful on any channel. (Transmission trouble, two Cabinets in parallel, a master and a slave.)	a. At the slave Cabinet only, disconnect INTERCONNECT cable connecting the two Cabinets. Note The master Cabinet is the Cabinet from whose PARALLEL TONES XMIT jack the output is being taken. The other Cabinet is the slave Cabinet. b. Key receiving loop from one of the sending loops, using a Keyer in the master Cabinet. If keying is successful, proceed to Step c. If not, proceed to Step e. c. Remove Control-Attenuator from slave Cabinet. If short-circuit is obtained across pins A and D of INTERCONNECT/A jack, proceed to test d. If not, see correction column.	Defect in Control-Attenuator, MODE switch, wiring or connector on Control-Attenuator. Replace defective component, or repair defective wiring.

TABLE 4-4. TELEGRAPH TERMINAL, TYPICAL TROUBLES (Continued)

TROUBLE	TEST	CORRECTION
	d. Remove Keyers from slave Cabinet, one at a time, until short-circuit indicated in test c has been eliminated.	If short-circuit is eliminated by removal on one of the Converters, localize trouble to a component or defective wiring of that module. If short-circuit is not eliminated by removal of all Converters, a short-circuit in the frame wiring or connector, or repair defective wiring.
	e. Disconnect INTERCONNECT cable from master Cabinet. Again attempt keying. If successful, see correction column. If not, proceed to test f.	Defective INTERCONNECT cable or one of its terminating connectors. Replace defective connector, or repair defective cable.
	f. Remove Control-Attenuator from both Cabinets. Set MODE switch on assembly taken from slave Cabinet to MASTER position; and plug it into master Cabinet. Adjust tone output level. Again attempt keying. If successful, see correction column. If not, proceed to test g.	Defective MODE switch, Control-Attenuator, or wiring of the Control-Attenuator initially in master Cabinet.
	g. Interchange master-slave function of the two Cabinets by interchanging Control-Attenuators, and by moving output cable connectors to PARALLEL TONES XMIT jack of Cabinet initially in slave mode. Reconnect INTERCONNECT cable. Again attempt keying. If keying is successful, see correction column. If not, proceed to test h. Note If keying is successful in test g, an alternate path for transmission has been established. Therefore, it can be used to maintain normal operation, and the indicated repair can be completed when convenient.	Defective output transformer, PARALLEL TONES XMIT connector, or wiring in Cabinet initially in the master mode. Replace defective component, or repair defective wiring.
	h. Disconnect INTERCONNECT cable Again attempt keying. If successful, perform tests 1c and 1d above.	Defective cable connecting transmitting equipment to receiving equipment. Replace defective cable.

TABLE 4-4. TELEGRAPH TERMINAL, TYPICAL TROUBLES (Continued)

TROUBLE	TEST	CORRECTION
2. Keying not successful on any channel. (Receiving trouble, two Cabinets in parallel.)	a. Waveform C of figure 4-8 observed on Oscilloscope connected between AGC and COM test points on any Converter in the master Cabinet. If trouble is really affecting all receiving channels, as assumed, the normal waveshape will not be observed.	
	b. Disconnect INTERCONNECT cable at slave Cabinet only. If waveform in test a, above, is now observed, perform test 2c and 2d. If not, proceed to test e.	
	c. Remove Control-Attenuator from slave Cabinet. If short-circuit is obtained (1) across pins B and D of INTERCONNECT/A jack while PARALLEL TONES RCVR A channel is being used, or (2) across pins C and D while PARALLEL TONES RCVR B channel is being used, proceed to test d. If not, see correction column.	Short-circuit in MODE switch connector, or wiring in assembly. Replace defective component, or repair defective wiring.
	d. Remove Converters from slave Cabinet, one at a time, until short-circuit indicated in test c is eliminated.	If short-circuit is eliminated by removal on one of the Converters, localize trouble to a component or defective wiring of that module. If short-circuit is not eliminated by removal of all Converters, a short-circuit in the frame wiring or connector is indicated. Replace defective connector, or repair defective wiring.
	e. Disconnect INTERCONNECT cable from master Cabinet. If normal signal is now observed, see correction column. If not, proceed to test f.	Defective INTERCONNECT cable. Replace or repair cable.

TABLE 4-4. TELEGRAPH TERMINAL, TYPICAL TROUBLES (Continued)

TROUBLE	TEST	CORRECTION
	f. Remove Control-Attenuators from both Cabinets. On Control-Attenuator taken from slave Cabinet, set MODE switch to MASTER and plug unit into master Cabinet. If waveform C of figure 4-8 is now observed, see correction column. If not, proceed to test g.	Defective MODE switch, or module wiring on Control-Attenuator initially in the master Cabinet. Replace defective switch, or repair defective wiring.
	g. Interchange the master-slave functions of the two Cabinets. Move input connector to the PARALLEL TONES RCVR A or RCVR B jack of the new master Cabinet (initially in the slave mode). Reconnect INTERCONNECT cable. If normal indication is observed, proceed to test f. If not, see correction column. Note If normal indication is observed in test g, an alternate path for transmission has been established; it may be used to obtain normal operation and the indicated repair may be made when convenient.	Defective transformer, PARALLEL TONES RCVR A or RCVR B, or Cabinet wiring in frame initially in master mode. Replace defective component.
	h. Disconnect INTERCONNECT cable. Check for waveform C of figure 4-8 on Oscilloscope connected between TONE IN and COM test points of the Converter in the new master Cabinet. Perform tests 1c and 2d, on the Cabinet placed in the slave mode during performance of test g.	
3. Keying not successful on any channel. (Transmission trouble, single Cabinet, eight-channel operation.)	a. 9 dbm level indicated on ME-6( ) connected between pins A and D (gnd) of INTERCONNECT/ A jack If level is indicated, proceed to test b. If not, proceed to test d.	
	b. Check for +12V between +12V and COM test point on Control-Attenuator. If obtained, proceed to to step c. If not, see correction column.	Defective Control-Attenuator, connector, or wiring. Replace defective component, or repair defective wiring.

TABLE 4-4. TELEGRAPH TERMINAL, TYPICAL TROUBLES (Continued)

TROUBLE	TEST	CORRECTION
	c. Remove Control-Attenuator. Check for tone level across pins A and D of INTERCONNECT/A jack. If obtained, see correction column. If not, proceed to step d.	Defective Control-Attenuator, connector, or wiring. Replace defective component, or repair defective wiring.
	d. Check for +12 volts between +12V and COM test points on any Keyers. If obtained, proceed to test e. If not, see correction column.	Defective Control-Attenuator, Cabinet, connection, or wiring. Trace for loss of a-c power. Replace defective component or wiring.
	e. Remove Control-Attenuator. Check for short-circuit across pins A and D of INTERCONNECT/A jack. If so, proceed to test f. If not, see correction column.	Defective Control-Attenuator, MODE switch, connector or wiring Control-Attenuator. Replace defective component, or repair wiring.
	f. Remove Keyers, one at a time, until short-circuit indicated in e, above, is eliminated or all Keyers have been removed. Refer to correction column.	If removal of a Keyer eliminates the short-circuit, check for defective component or wiring in input circuit of that Keyer (see c, below). Replace defective component, or repair wiring. If removal of all Keyers does not eliminate the short-circuit, a short-circuit exists in Cabinet wiring or connectors.
4. Keying not successful on any channel. (Receiving trouble, single Cabinet, eight-channel operation.)	a. Check for Multimeter indication of +12 volts between +12V and COM test points on any Converter. If indicated, proceed to test b. If not, see correction column.	Defective Control-Attenuator/Cabinet connection or wiring. Trace loss of a-c power. Replace defective component or wiring.
	b. Remove Control-Attenuator. Check for a short-circuit on INTERCONNECT/A jack (1) across pins B and D if PARALLEL TONES RCVR A is in use, (2) across pins C and D if RCVR B is in use. If a short-circuit is indicated, proceed to test c. If not, proceed to test d.	

TABLE 4-4. TELEGRAPH TERMINAL, TYPICAL TROUBLES (Continued)

TROUBLE	TEST	CORRECTION
	c. Remove Converters, one at a time, from Cabinet until all Converters have been removed or the short-circuit detected in b, above, has been eliminated; then see correction column.	Defective component or wiring in input circuit of that Converter. Replace defective component or wiring.
5. Trouble involving a diversity pair.	a. Remove module of pair in slave station of Cabinet (stations A2, A4, A6, and A8). Key, using remaining channel of diversity combination. If keying is successful, see correction column. If not, proceed to test b.	Module that was removed from Cabinet is defective.
	b. Remove Keyer (or Converter) through which keying was unsuccessful in test a, and remove corresponding Converter (or Keyer). Plug Keyer (or Converter) that was removed during test a and corresponding Converter (Keyer) into master station (A2, A3, A5, or A7). Proceed to test c.	
	c. Key with modules installed in test b.	If keying is successful, module tested in a, above is defective. If keying is not successful, station wiring or connector is defective.
6. Trouble involving four-channel diversity combinations.	Perform the tests of 5a, b, c on all four modules of the diversity combination, by inserting them one at a time into the master station (A1, A3, A5, or A7).	If one module fails to provide successful keying, the module is defective; replace or repair. If all modules fail to provide successful keying, station wiring or connector is defective.
7. Trouble involving a single tone channel.	a. Replace printed-circuit card assembly and then key. If keying is successful, see correction column. If not, proceed to test b.	Printed-circuit card originally in module is defective. Repair printed-circuit card.
	b. Move Keyer (or Converter) module to another station and also move corresponding Converter (or Keyer) module to the same station. See station cabling diagram and use stations that are connected. Attempt keying.	If keying is successful, Cabinet wiring at original station position is defective. Repair wiring. If keying is not successful, component in module is defective; repair module.

TABLE 4-5. KEYER CARD D-C VOLTAGE LEVELS
(STEADY MARK, 60 MA INPUT
NORMAL SENSE)

ACTIVE ELEMENT	VOLTAGE	ACTIVE ELEMENT		VOLTAGE
IC2 through IC8		Q1	C	11
pin 1	0		B	1.25
pin 2	0.6		E	0.6
pin 3	0			
pin 4	0	Q2	C	5.5
pin 5	0.6		B	3.5
pin 6	0.25		E	3
pin 7	0.82			
pin 8	3.0	Q3	C	12
			B	5.2
IC9 and IC10			E	4.6
pin 1	4.8	Q4		
pin 2	1.8		C	1.7
pin 3	0.7		B	2.4
pin 4	1.2		E	1.7
pin 5	0			
pin 6	5.5	Q5	C	3.6
pin 7	6.5		B	1.2
pin 8	0		E	1.7
pin 9	11.9			
pin 10	4.5	Q6	C	0.15
			B	0.59
			E	0
		Q7	C	11.9
			B	0.15
			E	0

Note: Care must be exercised in obtaining keyer voltage levels. If the probe used causes the oscillator or divider circuits to stop, incorrect readings will

TABLE 4-6. CONVERTER CARD D-C VOLTAGE LEVELS
(STEADY MARK, 0 DBM INPUT
NORMAL SENSE, 60 MA OPERATION)

ACTIVE ELEMENT		VOLTAGE	ACTIVE ELEMENT		VOLTAGE	ACTIVE ELEMENT		VOLTAGE
IC1	pin 1	11.2	IC3	pin 1	7.2	Q7	C	11.0
	pin 2	4.0		pin 2	4.0		B	2.8
	pin 3	4.0		pin 3	4.0		E	2.2
	pin 4	3.4		pin 4	3.4	Q8	C	2.4
	pin 5	0		pin 5	0		B	2.9
	pin 6	11.2		pin 6	7.2		E	2.2
	pin 7	10.5		pin 7	6.5	Q10	C	12
	pin 8	4.1		pin 8	12		B	10.0
	pin 9	12		pin 9	12		E	9.4
	pin 10	10.5		pin 10	6.5	Q11	C	12
							B	9.4
IC2	pin 1	11.2	IC4	pin 1	7.2		E	8.9
	pin 2	4.0		pin 2	4.0	Q3	C	12
	pin 3	4.0		pin 3	4.0		B	5.7
	pin 4	3.4		pin 4	4.2		E	5.1
	pin 5	0		pin 5	0	Q4	C	4.6
	pin 6	11.2		pin 6	7.2		B	0.6
	pin 7	10.5		pin 7	6.5		E	0
	pin 8	4.1		pin 8	12	Q5	C	12
	pin 9	12		pin 9	12		B	4.6
	pin 10	10.5		pin 10	6.5		E	4.1
						Q6	C	5.5
							B	6.0
							E	5.3
						Q9	C	6.7
							B	0.55
							E	0.56

TABLE 4-7. CONTROL-ATTENUATOR CARD D-C VOLTAGE LEVELS
(0 DBM, 1000 Hz INPUT)

ACTIVE ELEMENT		VOLTAGE	ACTIVE ELEMENT		VOLTAGE	ACTIVE ELEMENT		VOLTAGE
IC1	pin 1	11.5	IC2	pin 1	7.5	Q1A	C	4.3
	pin 2	4.0		pin 2	4.0		B	0.65
	pin 3	4.0		pin 3	4.0		E	0.03
	pin 4	3.4		pin 4	3.4			
	pin 5	0		pin 5	0	Q1B	C	12
	pin 6	11.5		pin 6	7.5		B	4.3
	pin 7	11.0		pin 7	7.0		E	3.8
	pin 8	3.8		pin 8	12.0	Q2	C	11.5
	pin 9	12.0		pin 9	12.0		B	4.0
	pin 10	11.0		pin 10	7.0		E	3.4

SECTION 5

MAINTENANCE

5-1. FAILURE, PERFORMANCE, AND OPERATIONAL REPORTS.

The Naval Ship Systems Command no longer requires the submission of Failure Reports for all equipments. Failure Reports and Performance and Operational Reports are to be accomplished for designated equipments (refer to Electronics Installation and Maintenance Book NAVSHIPS 0967-000-0000 formerly NAVSHIPS 900, 000) only to the extent required by existing directives. All failures shall be reported for those equipments requiring the use of Failure Reports.

5-2. USE OF ADJUSTMENT PROCEDURES.

Adjustments that are dependent upon system connections are given in paragraph 2-4 and are performed as a part of the installation procedure; they may also be performed as specified in the general procedures described in paragraph 5-4. Procedures that are independent of system connections should be performed only as specified in paragraph 5-4. Refer to figures 5-1 through 5-19 as required, during performance of adjustment or repair.

5-3. TEST EQUIPMENT REQUIRED FOR REPAIR.

The test units required for repair of the Telegraph Terminal are Frequency Meter AN/USM-207 ( ), Oscilloscope AN/USM-117 ( ), Electronic Multimeter ME-6 ( )/U, Multimeter AN/PSM-4 ( ), Test Set Telegraph TS-2232A/UCC-1C(V) (hereafter referred to as frequency counter, oscilloscope, ME-6, Multimeter, Test Set).

5-4. GENERAL ADJUSTMENT PROCEDURES.

a. ADJUSTMENTS AFTER A CHANGE IN SYSTEM CONFIGURATION. - Perform the procedures described in paragraph 2-4 for all modules affected by the change in system configuration.

b. ADJUSTMENTS AFTER REPLACEMENT OR REPAIR OF KEYER CIRCUIT CARD. -

(1) Perform the procedure described in paragraph 2-4.

(2) Perform the procedure described in paragraph 5-5.

c. ADJUSTMENTS AFTER REPLACEMENT OR REPAIR OF CONVERTER CIRCUIT CARD. Perform the procedure described in paragraph 2-4.

d. ADJUSTMENTS AFTER REPLACEMENT OR REPAIR OF CONTROL-ATTENUATOR CIRCUIT CARD. - Perform the procedure described in paragraph 2-4.

e. ADJUSTMENT AFTER REPAIR OF TEST SET. - Perform the procedure described in paragraph 5-6.

5-5. KEYER ADJUSTMENTS

a. TONE-LEVEL ADJUSTMENT. - Perform the tone-level adjustment as follows:

(1) Plug the test cable of the Test Set into the TEST connector on the Keyer front panel.

(2) Transmit a steady mark signal to the Keyer. This signal may be furnished from the external loop if the loop is connected to the Keyer. If the loop is not connected to the Keyer, turn the FUNCTION switch of the Test Set to REV. OUT and turn the MODE switch to MARK.

(3) Observe the Test Set meter and adjust the Keyer TONE control to obtain an indication of zero dbm.

Note

The loudspeaker of the Test Set should produce an audible mark tone for the channel.

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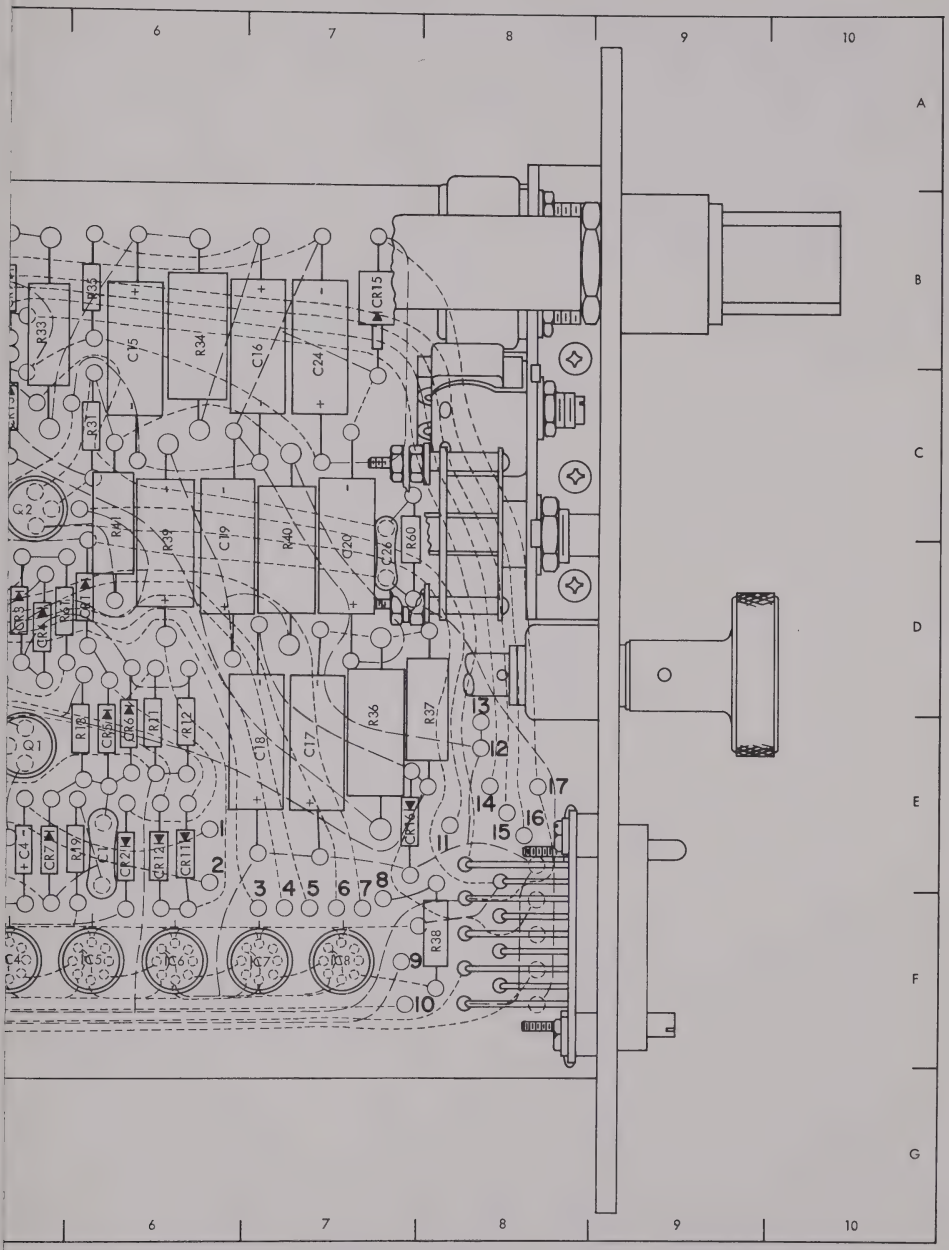


Figure 5-1. Keyer Card, Unit 1A1A1, Parts Location

(Blank)

REFERENCE DESIGNATION	LOCATION
C1	E6
C2	Not Used
C3	Not Used
C4	E5
C5	Not Used
C6	E5
C7	B4
C8	B4
C9	E1
C10	F4
C11	B4
C12	E4
C13	Not Used
C14	Not Used
C15	B6
C16	B7
C17	E7
C18	E7
C19	D6
C20	D7
C21	Not Used
C22	E3
C23	B4
C24	B7
C25	C5
C26	D7
C27	C5
CR1	D6
CR2	E6
CR3	D5
CR4	D5
CR5	E6
CR6	E6
CR7	E5
CR8	Not Used
CR9	B5
CR10	B5
CR11	E6
CR12	E6
CR13	C5
CR14	C5
CR15	B7
CR16	E7
CR17	C5
CR18	C4
CR19	D4
E1	D3
IC1	Not Used
IC2	F4
IC3	F5
IC4	F6
IC5	F6
IC6	F6
IC7	F7
IC8	F7
IC9	E4
IC10	B4
Q1	E5
Q2	C5
Q3	D3
Q4	D4
Q5	D4
Q6	C5
Q7	D5

REFERENCE DESIGNATION	LOCATION
R1 – R10	Not Used
R11	E6
R12	E6
R13	E6
R14	C8
R15	E5
R16	E5
R17	E5
R18	E5
R19	E6
R20	B5 B4
R21	Not Used
R22	Not Used
R23	Not Used
R24	B3
R25	B3
R26	B3
R27	Not Used
R28	Not Used
R29	Not Used
R30	E4
R31	C6
R32	Not Used
R33	B5
R34	B6
R35	B6
R36	E7
R37	E8
R38	F8
R39	D6
R40	D7
R41	C6
R42	F3
R43	F3
R44	F3
R45	E3
R46	B4
R47	C4
R48	C3
R49	C3
R50	C3
R51	D4
R52	C4
R53	C4
R54	C4
R55	D4
R56	B8
R57	D4
R58	C4
R59	D5
R60	C7
R61	D5
RT1	D5

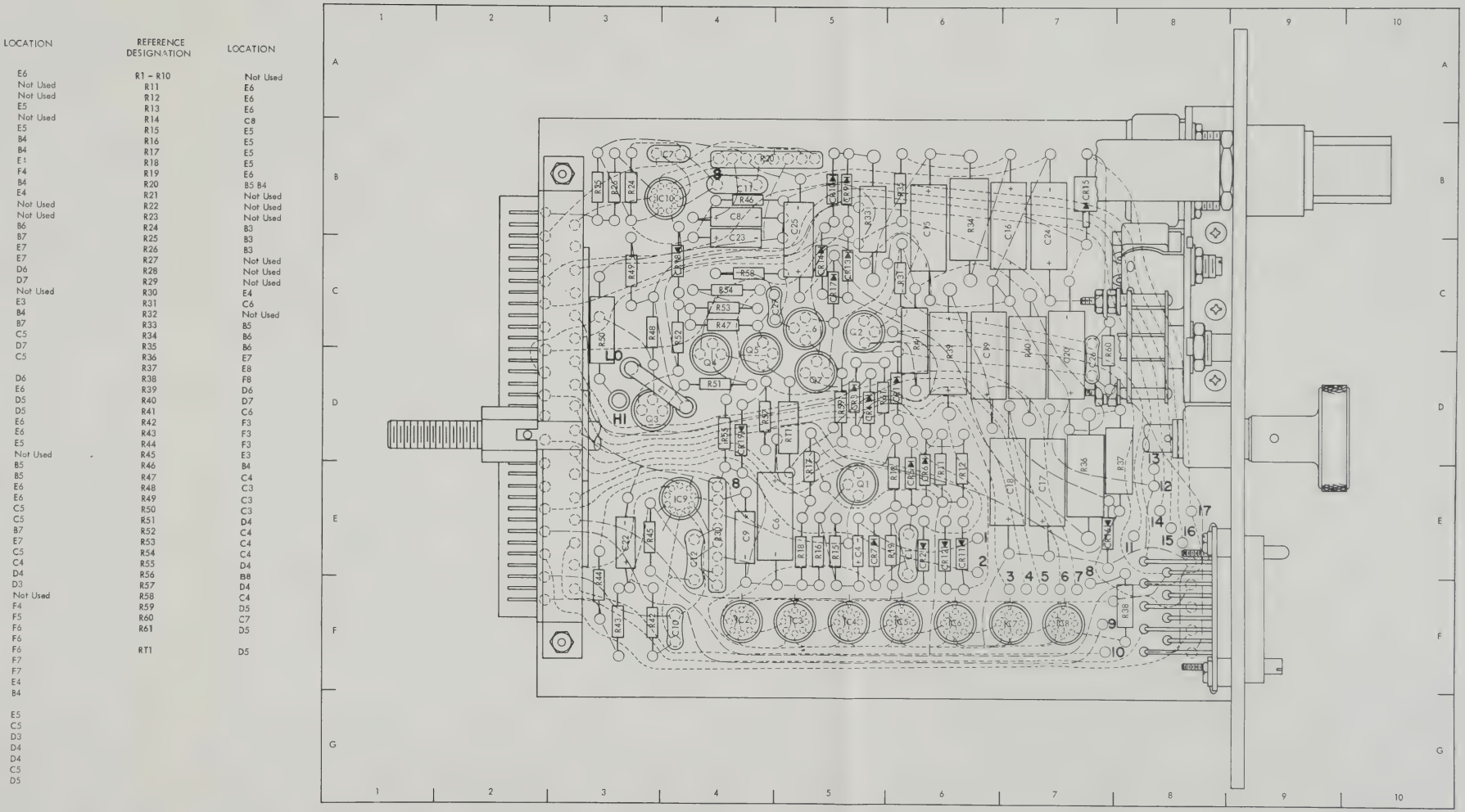


Figure 5-1. Keyer Card, Unit 1A1A1, Parts Location

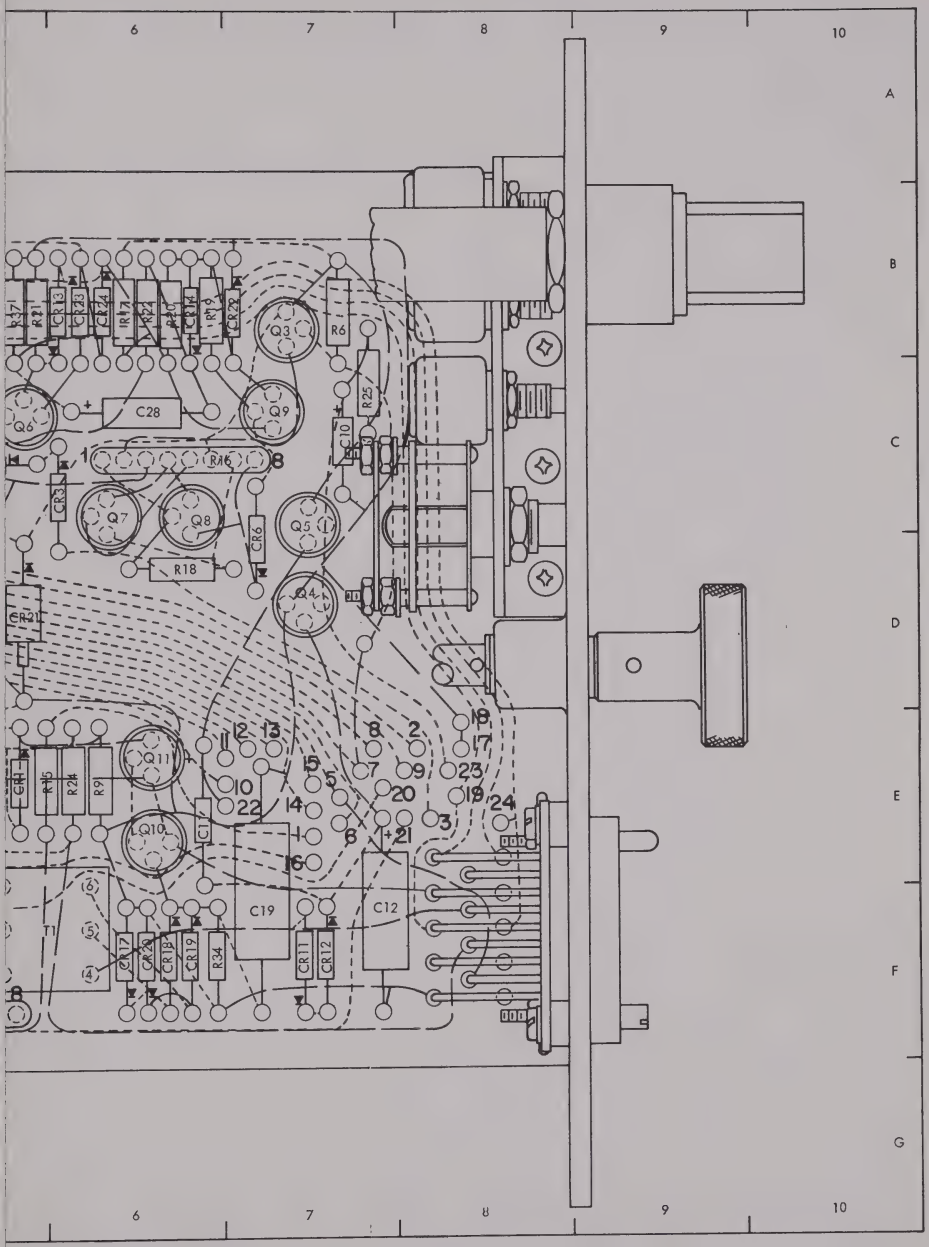


Figure 5-2. Converter Card, Unit 1A2A1, Parts Location

REFERENCE DESIGNATION	LOCATION
C1	Not Used
C2	E & F4
C3	E4
C4	E & F4
C5	E4
C6	E4
C7	F5
C8	F5
C9	F5
C10	C7
C11	E6
C12	F7
C13	C4 & 5
C14	Not Used
C15	Not Used
C16	D5
C17	D4
C18	D4
C19	E & F7
C20	Not Used
C21	E3 & 4
C22	C3
C23	Not Used
C24	Not Used
C25	Not Used
C26	B5
C27	B5
C28	C6
CR1	E5
CR2	E5
CR3	C6
CR4	C5
CR5	B4 & 5
CR6	C & D7
CR7	B3
CR8	B3
CR9	C3
CR10	C3
CR11	F7
CR12	F7
CR13	B6
CR14	B6
CR15	C & D3
CR16	D3
CR17	F6
CR18	F6
CR19	F6
CR20	F6
CR21	D5
CR22	B7
CR23	B6
CR24	B6
IC1	F3
IC2	E3
IC3	F4
IC4	E5

REFERENCE DESIGNATION	LOCATION
L1	B4
Q1	Not Used
Q2	Not Used
Q3	B7
Q4	C7
Q5	C7
Q6	C5
Q7	C6
Q8	C6
Q9	C7
Q10	E6
Q11	E6
R1	C8
R2	F3 & 4
R3	E3 & 4
R4	F5
R5	E4 & 5
R6	B7
R7	Not Used
R8	E & F3
R9	E6
R10	B3
R11	C3
R12	C3
R13	B3
R14	B8
R15	E5 & 6
R16	C6
R17	B6
R18	D6
R19	B6
R20	B6
R21	B5
R22	B6
R23	B5
R24	E6
R25	C7
R26	D8
R27	F3
R28	Not Used
R29	Not Used
R30	Not Used
R31	D3
R32	D4
R33	D5
R34	F6
R35	Not Used
R36	Not Used
R37	B5
T1	E & F5 & 6

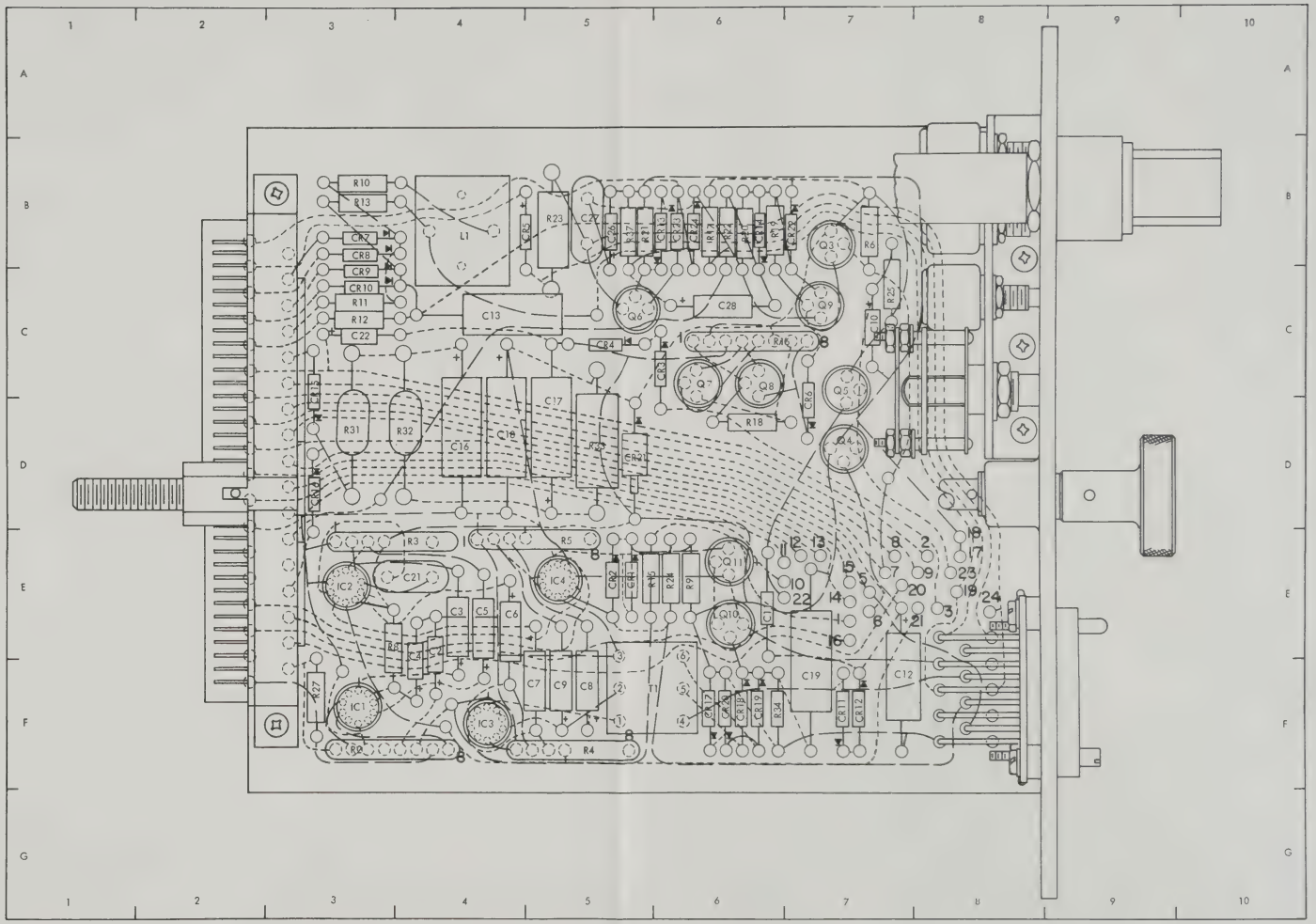


Figure 5-2. Converter Card, Unit 1A2A1, Parts Location

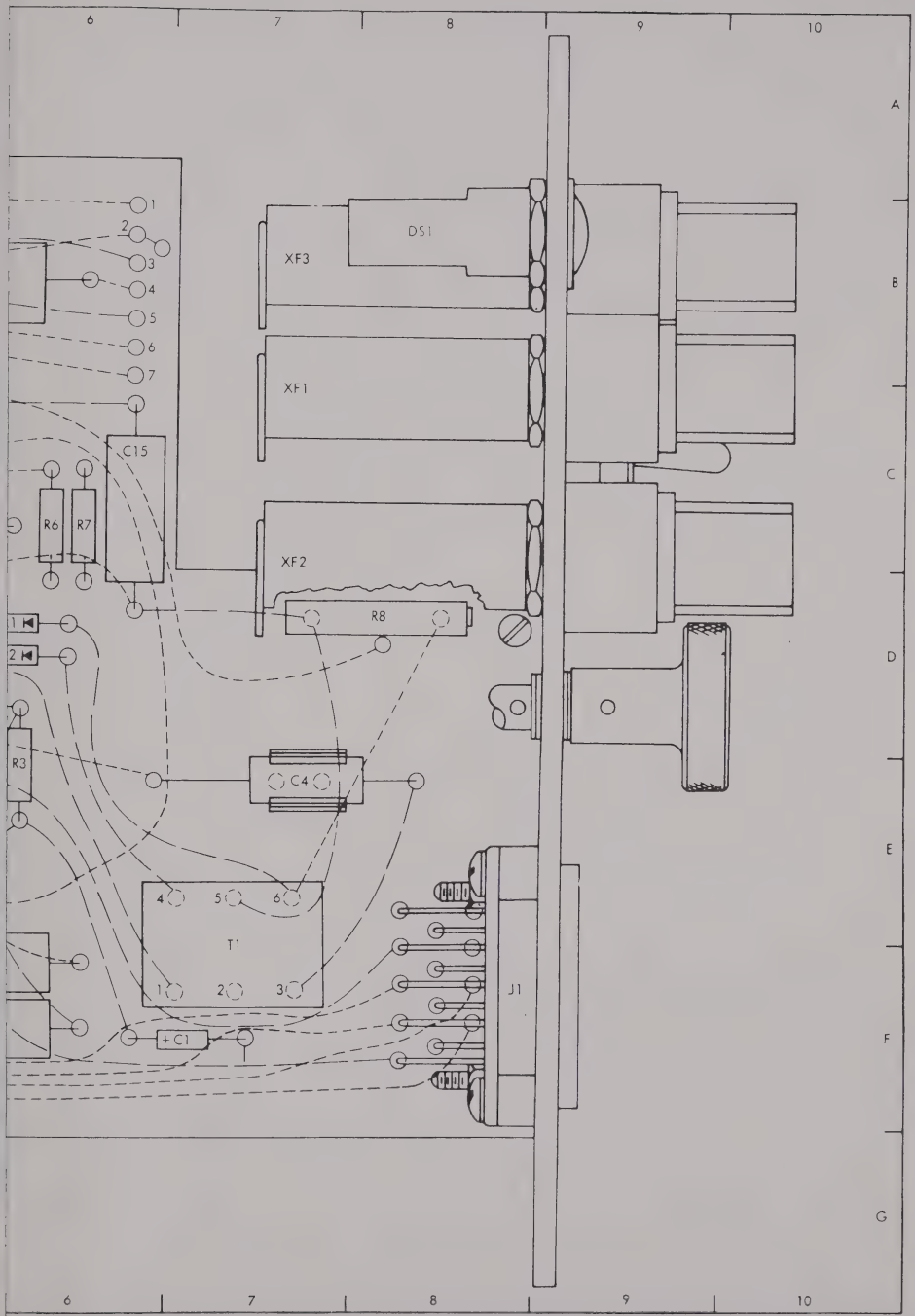
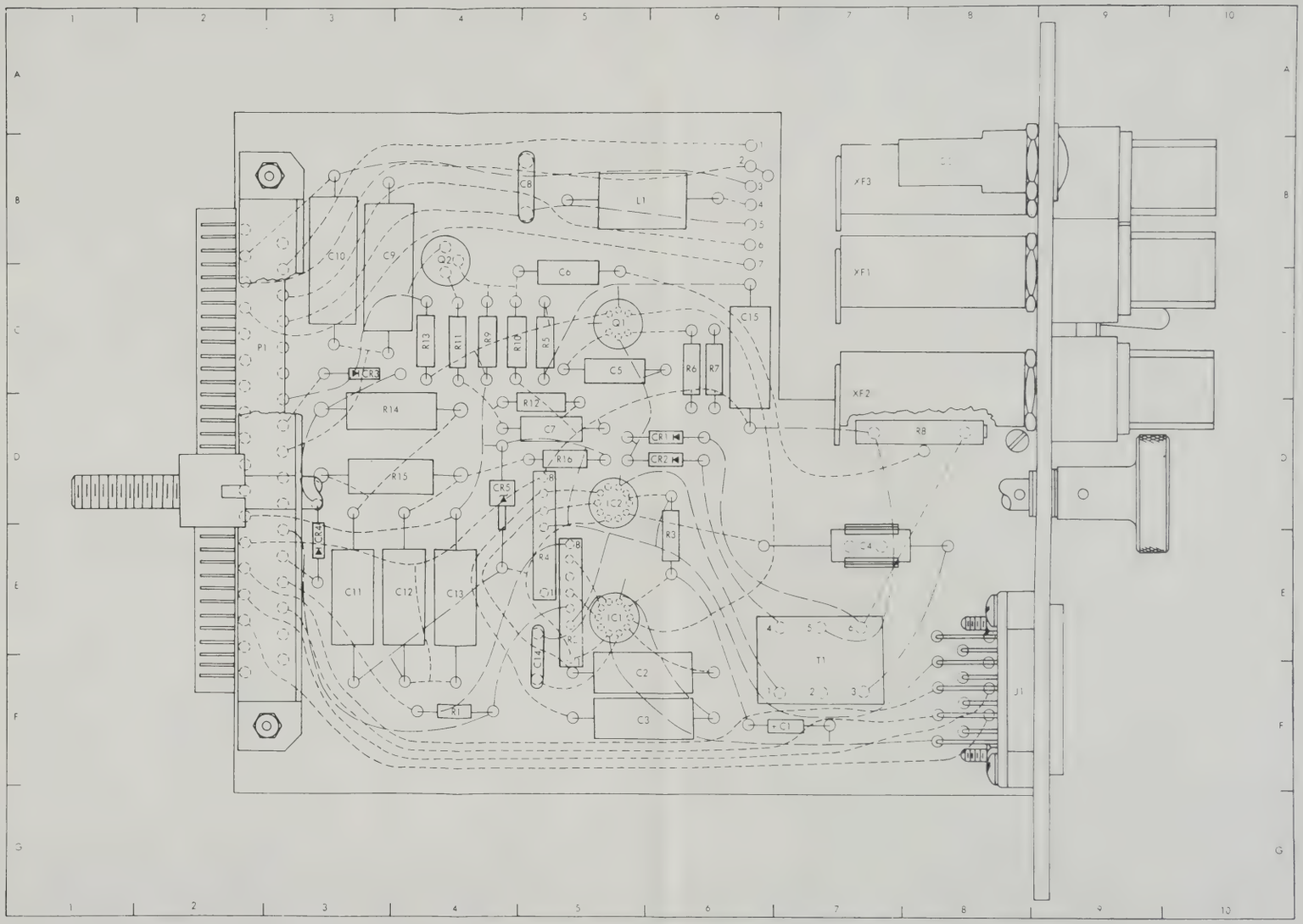


Figure 5-3. Control-Attenuator Card, Unit 1A3A1, Parts Location

REFERENCE DESIGNATION	LOCATION
C1	F6 & 7
C2	F5 & 6
C3	F5 & 6
C4	E7 & 8
C5	C5
C6	C5
C7	D5
C8	B5
C9	BC3 & 4
C10	BC3
C11	E3
C12	E3 & 4
C13	E4
C14	EF5
C15	CD6
CR1	D6
CR2	D6
CR3	C3
CR4	E3
CR5	D4
DS1	B7 & 8
IC1	E5
IC2	DE5
J1	EF8
L1	B5 & 6
P1	BCDEF 2 & 3
Q1	C5
Q2	BC4
R1	F4
R2	EF5
R3	E6
R4	DE5
R5	C5
R6	C6
R7	C6
R8	D7 & 8
R9	C4
R10	C4 & 5
R11	C4
R12	D5
R13	C4
R14	D3 & 4
R15	D3 & 4
R16	D5
T1	EF6 & 7
XF1	BC7 & 8
XF2	CD7 & 8
XF3	B7 & 8



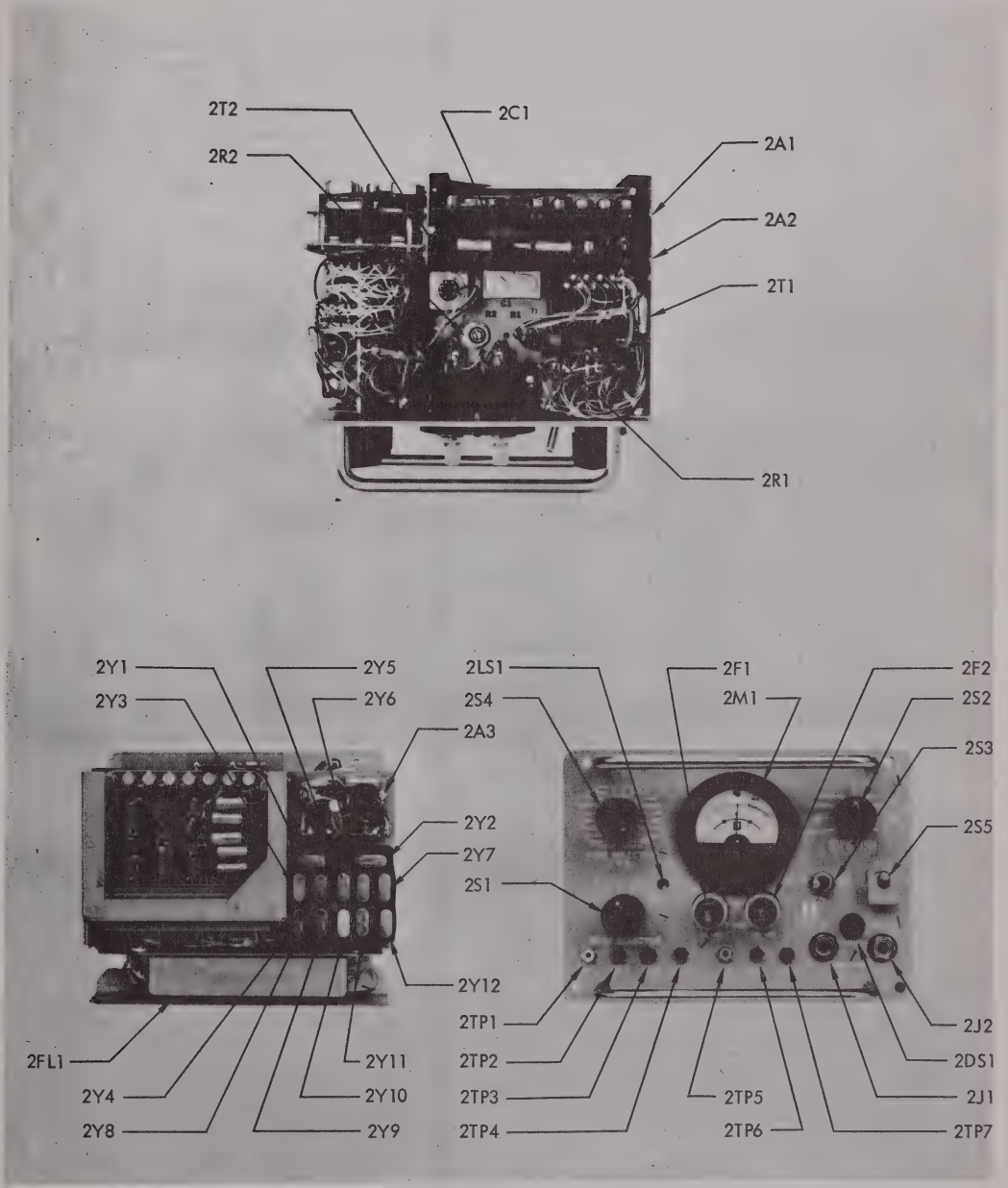
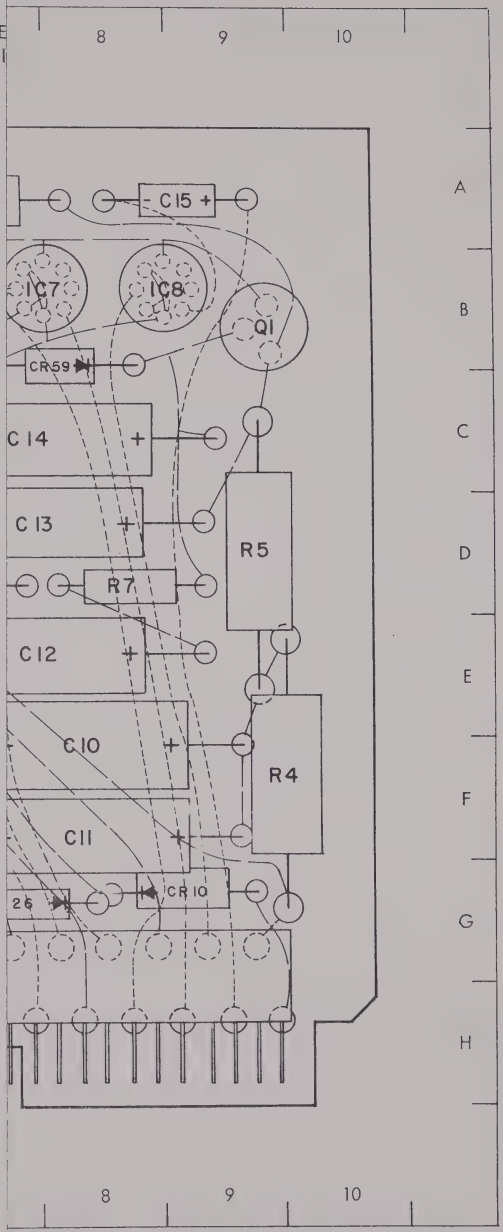


Figure 5-4. Test Set, Unit 2, Telegraph TS-2232 A/UCC-1C(V), Location of Assemblies and Parts

(Blank)

REFERENCE DESIGNATION	LOCATION
C4	B 1 & 2
C5	B 2 & 3
C6	B 3 & 4
C7	B 4 & 5
C8	B 5 & 6
C9	B 6 & 7
C10	EF 7 & 8
C11	FG 7 & 8
C12	E 7 & 8
C13	D 7 & 8
C14	C 7 & 8
C15	A 8 & 9
CR1	G2
CR2	G 3 & 4
CR3	G2
CR4	F2
CR5	F2
CR6	E 3 & 4
CR7	E2
CR8	D2
CR9	G 3 & 4
CR10	G 8 & 9
CR11	F 3 & 4
CR12	F 3 & 4
CR13	E2
CR14	E 3 & 4
CR15	F 3 & 4
CR16	F2
CR17	F 3 & 4
CR18	D6
CR19	E5
CR20	E5
CR21	G5
CR22	F5
CR23	D5
CR24	D5
CR25	D5
CR26	G7
CR27	G5
CR28	E3
CR29	E2
CR30	E2
CR31	E3
CR32	F2
—— ——	COMPONENT SIDE
– – – – –	BACK SIDE



d Assembly, Unit 2A1,
ation

(Blank)

REFERENCE DESIGNATION	LOCATION
C4	B 1 & 2
C5	B 2 & 3
C6	B 3 & 4
C7	B 4 & 5
C8	B 5 & 6
C9	B 6 & 7
C10	EF 7 & 8
C11	FG 7 & 8
C12	E 7 & 8
C13	D 7 & 8
C14	C 7 & 8
C15	A 8 & 9
CR1	G2
CR2	G 3 & 4
CR3	G2
CR4	F2
CR5	F2
CR6	E 3 & 4
CR7	E2
CR8	D2
CR9	G 3 & 4
CR10	G 8 & 9
CR11	F 3 & 4
CR12	F 3 & 4
CR13	E2
CR14	E 3 & 4
CR15	F 3 & 4
CR16	F2
CR17	F 3 & 4
CR18	D6
CR19	E5
CR20	E5
CR21	G5
CR22	F5
CR23	D5
CR24	D5
CR25	D5
CR26	G7
CR27	G5
CR28	E3
CR29	E2
CR30	E2
CR31	E3
CR32	F2
CR33	C5
CR34	D 3 & 4
CR35	D2
CR36	D 3 & 4
CR37	D 3 & 4
CR38	D3
CR39	D2
CR40	D2
CR41	F6
CR42	C2
CR43	C3
CR44	F5
CR45	E5
CR46	ER
CR47	C 3 & 4
CR48	C2
CR49	C2
CR50	C3
CR51	F5
CR52	C5
CR53	C5
CR54	D5
CR55	F5
CR56	F6
CR57	
CR58	
CR59	BC 7 & 8
IC1	B 1 & 2
IC2	B 2 & 3
IC3	B 3 & 4
IC4	B 4 & 5
IC5	B 5 & 6
IC6	B 6 & 7
IC7	B 7 & 8
IC8	B 8 & 9
Q1	B9
R4	EF 9 & 10
R5	D9
R6	D7
R7	D8
R8	A 6 & 7

—— —— COMPONENT SIDE

– – – – – BACK SIDE

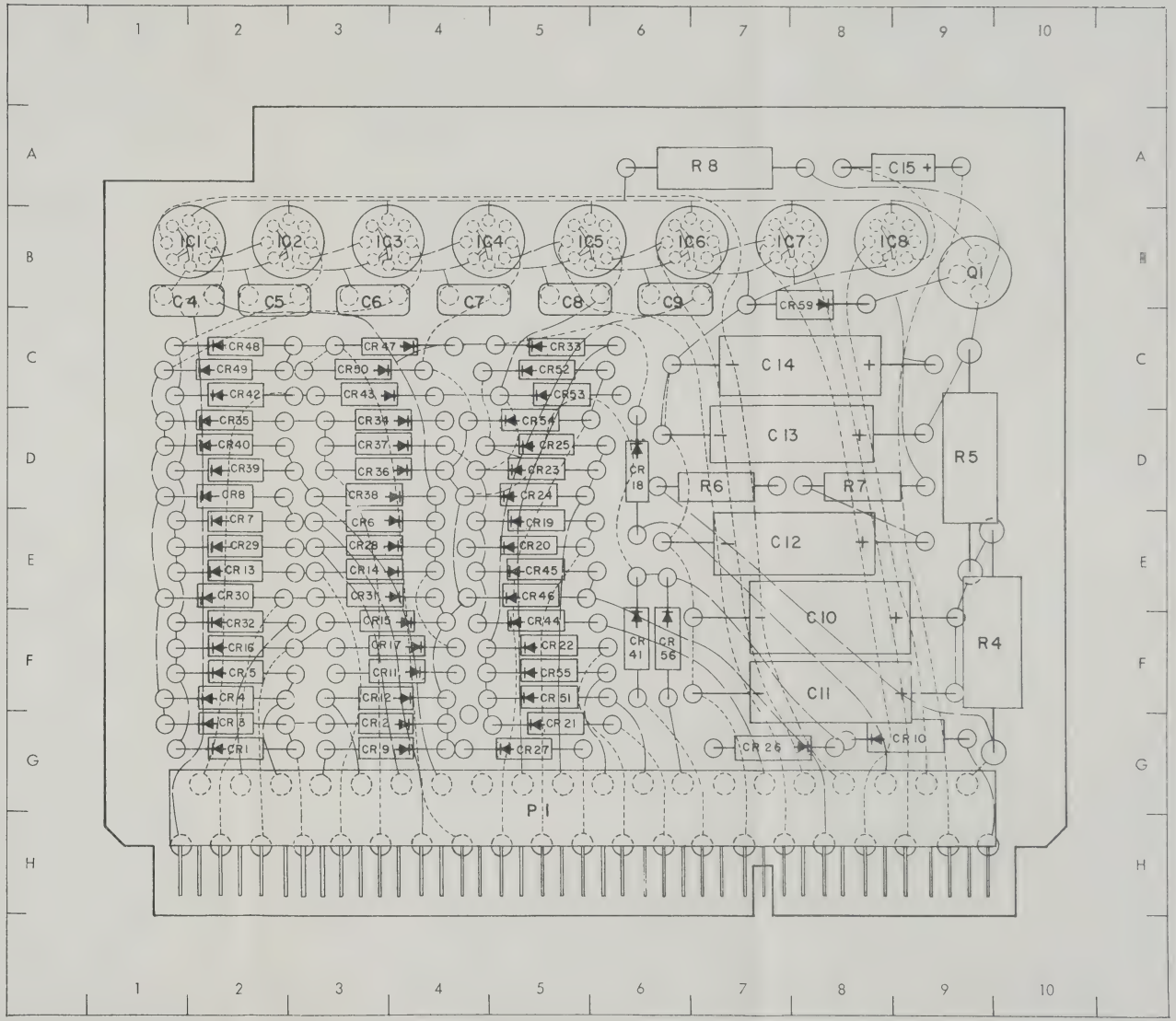


Figure 5-5. Counter Card Assembly, Unit 2A1, Parts Location

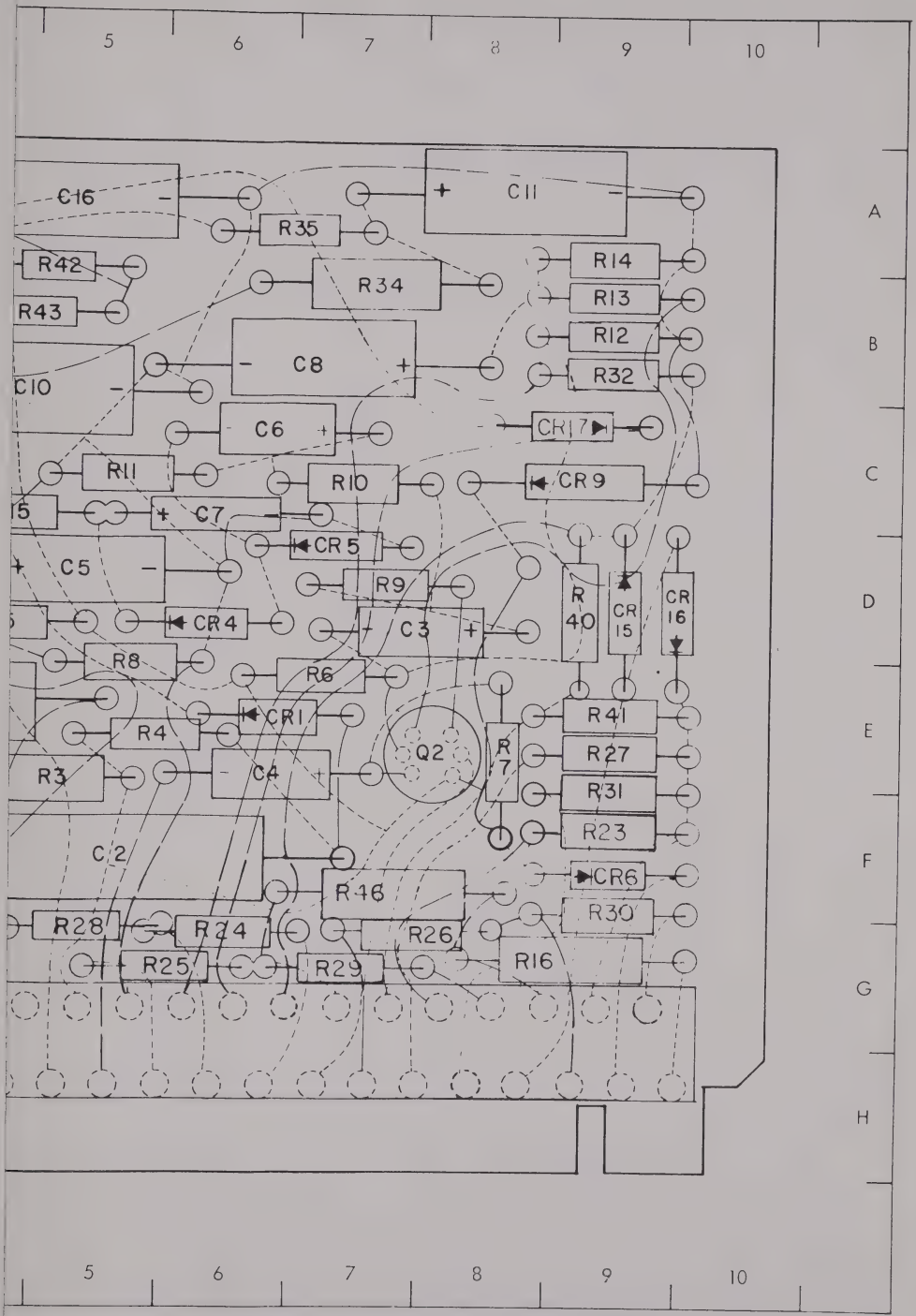


Figure 5-6. Amplifier Card Assembly, Unit 2A2 Parts Location

REFERENCE DESIGNATION	LOCATION
C1	E 3 & 4
C2	F 5 & 6
C3	D 7 & 8
C4	E6
C5	D5
C6	C6
C7	C6
C8	B 6 & 7
C10	BC 4 & 5
C11	A 8 & 9
C13	D 2 & 3
C14	CD1
C15	B2
C16	A 4 & 5
CR1	E 6 & 7
CR2	F2
CR3	E3
CR4	D6
CR5	D7
CR6	G9
CR7	F2
CR8	F 3 & 4
CR9	C 8 & 9
CR10	G2
CR11	G2
CR12	G 3 & 4
CR13	G 3 & 4
CR14	AB 3
CR15	D9
CR16	D 9 & 10
CR17	C8&9
IC1	CD3
Q1	AB 3
Q2	E 7 & 8
Q3	BC2

REFERENCE DESIGNATION	LOCATION
R1	F3
R3	EF 4 & 5
R4	E5
R5	D4
R6	E7
R7	E8
R8	E5
R9	D7
R10	C7
R11	C5
R12	B9
R13	B9
R14	A9
R15	C4
R16	F 8 & 9
R18	F2
R20	EF2
R23	F9
R24	G6
R25	G6
R26	G 7 & 8
R27	E9
R28	G5
R29	G 7 & 8
R30	G9
R31	EF9
R32	B9
R33	CD 3 & 4
R34	B7
R35	A 6 & 7
R36	CD2
R37	CD2
R38	BC2
R39	B1
R40	D9
R41	E9
R42	AB5
R43	B 4 & 5
R44	DE1
R45	D2

—— —— COMPONENT SIDE

------ BACK SIDE

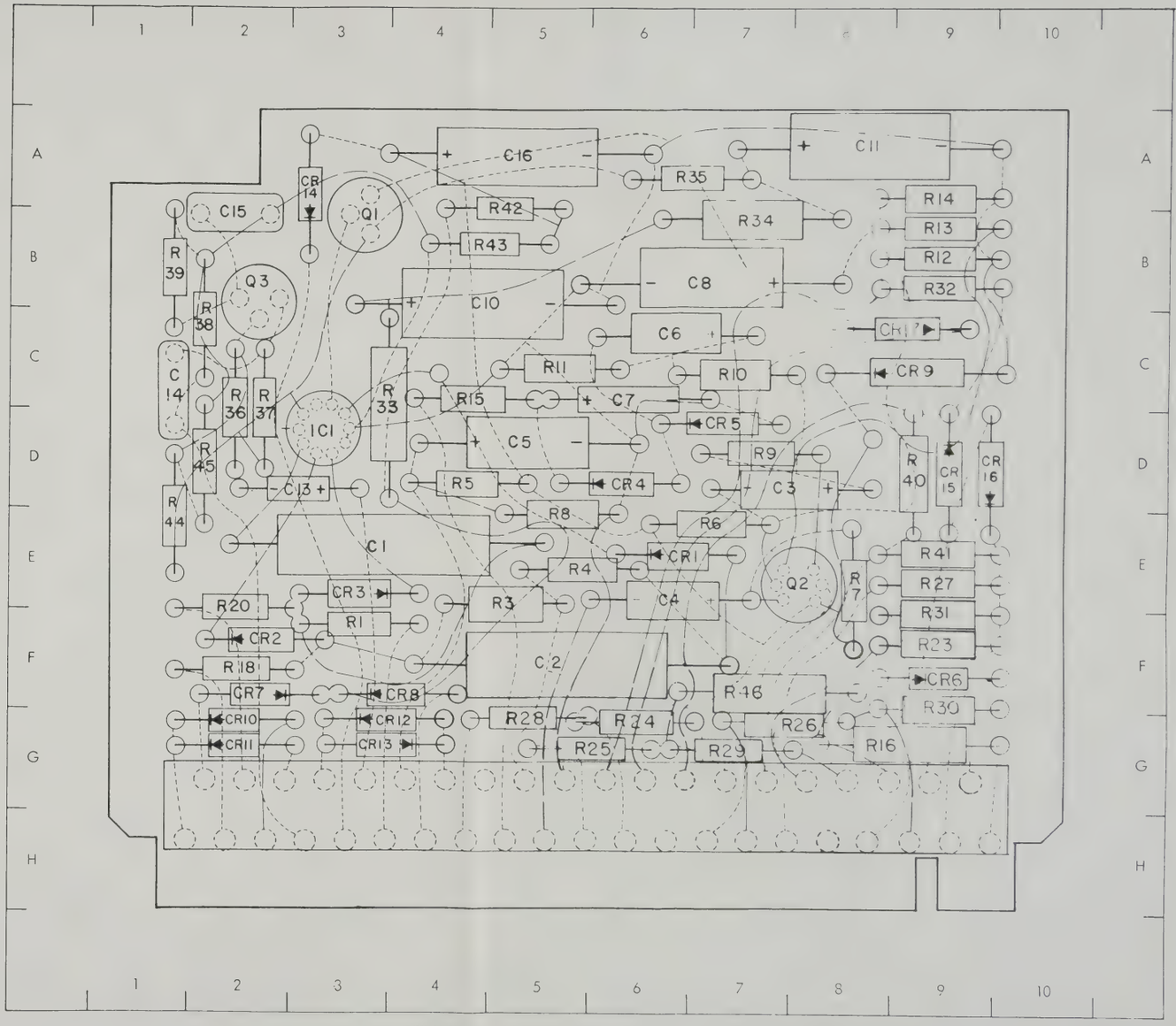


Figure 5-6. Amplifier Card Assembly, Unit 2A2 Parts Location

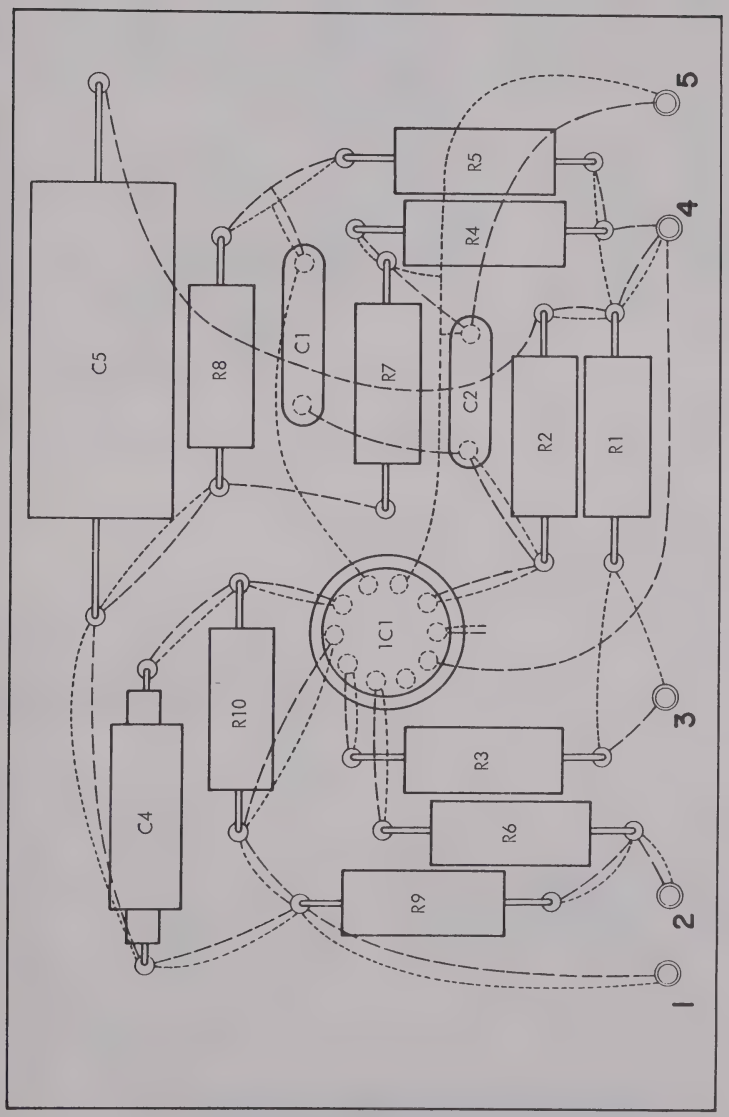


Figure 5-7. Oscillator Card Assembly, Unit 2A3, Parts Location

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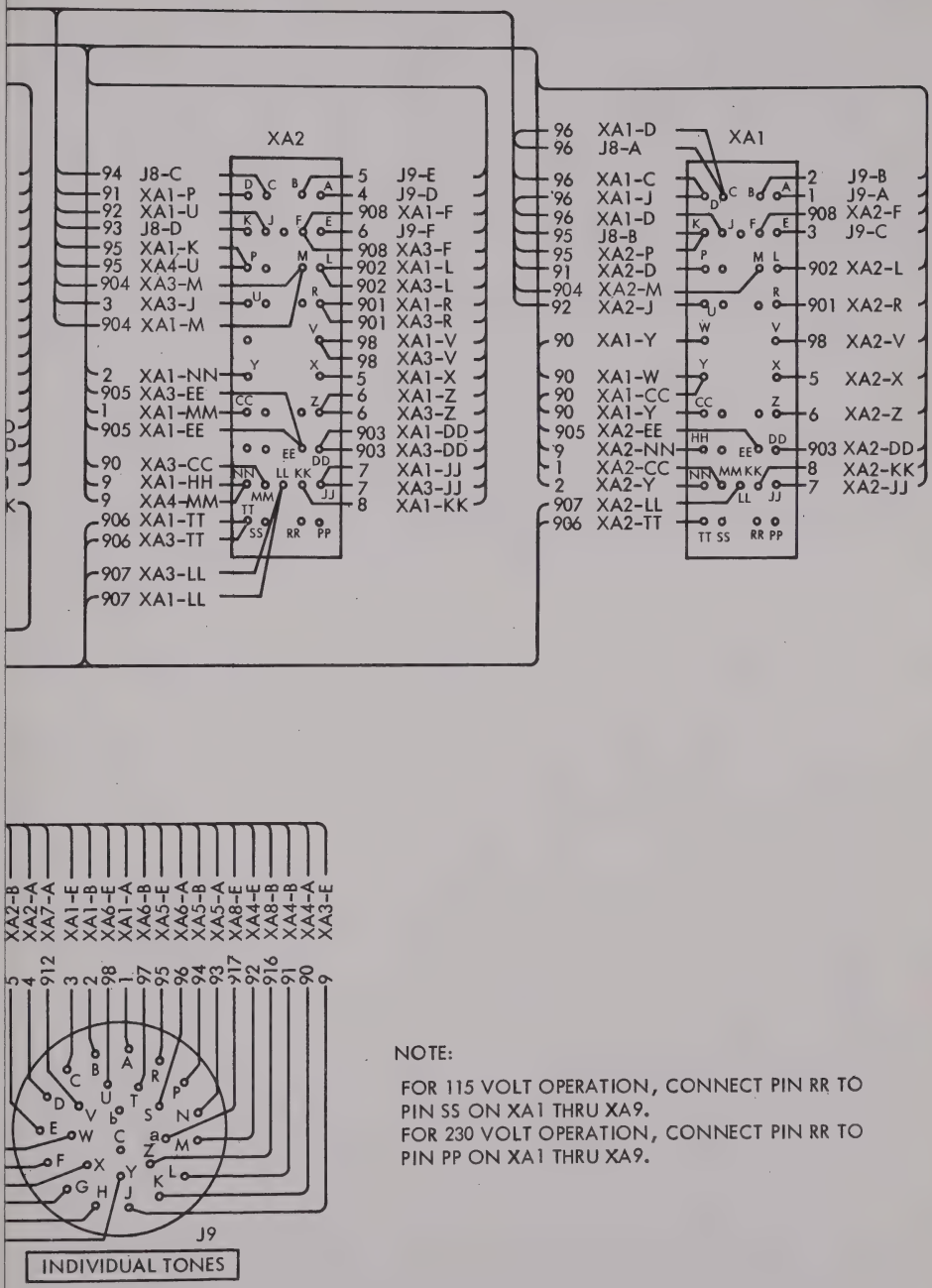

NOTE:

FOR 115 VOLT OPERATION, CONNECT PIN RR TO PIN SS ON XA1 THRU XA9.
FOR 230 VOLT OPERATION, CONNECT PIN RR TO PIN PP ON XA1 THRU XA9.

Figure 5-8. Cabinet, Electrical Equipment, CY-4639A/UCC-1C(V), Wiring Diagram

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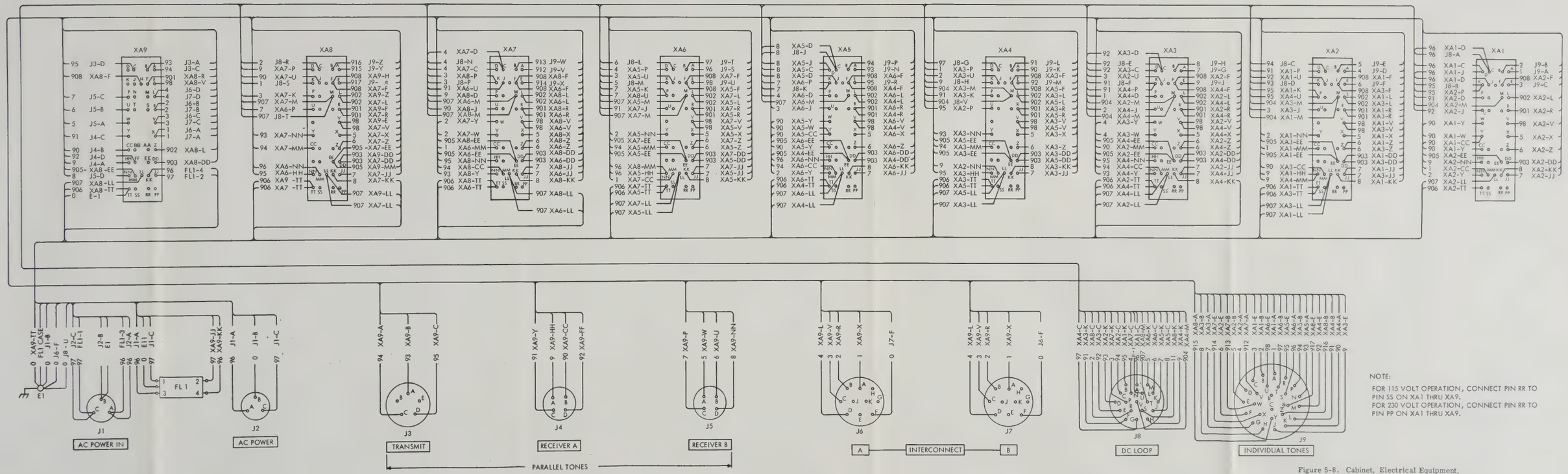


NOTE:

FOR 115 VOLT OPERATION, CONNECT PIN RR TO PIN SS ON XA1 THRU XA9.
FOR 230 VOLT OPERATION, CONNECT PIN RR TO PIN PP ON XA1 THRU XA9.

Figure 5-8. Cabinet, Electrical Equipment, CY-4639A/UCC-1C(V), Wiring Diagram

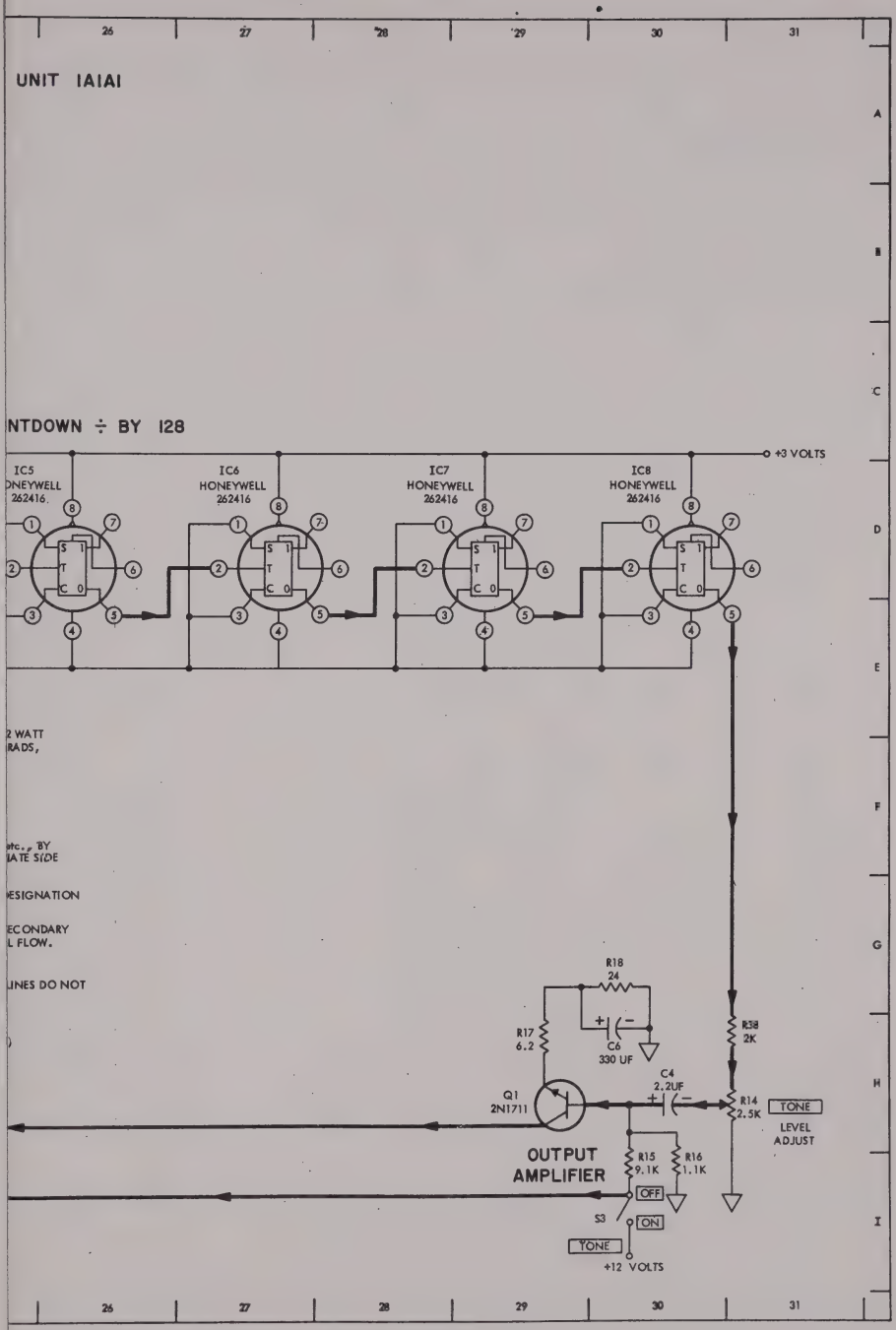
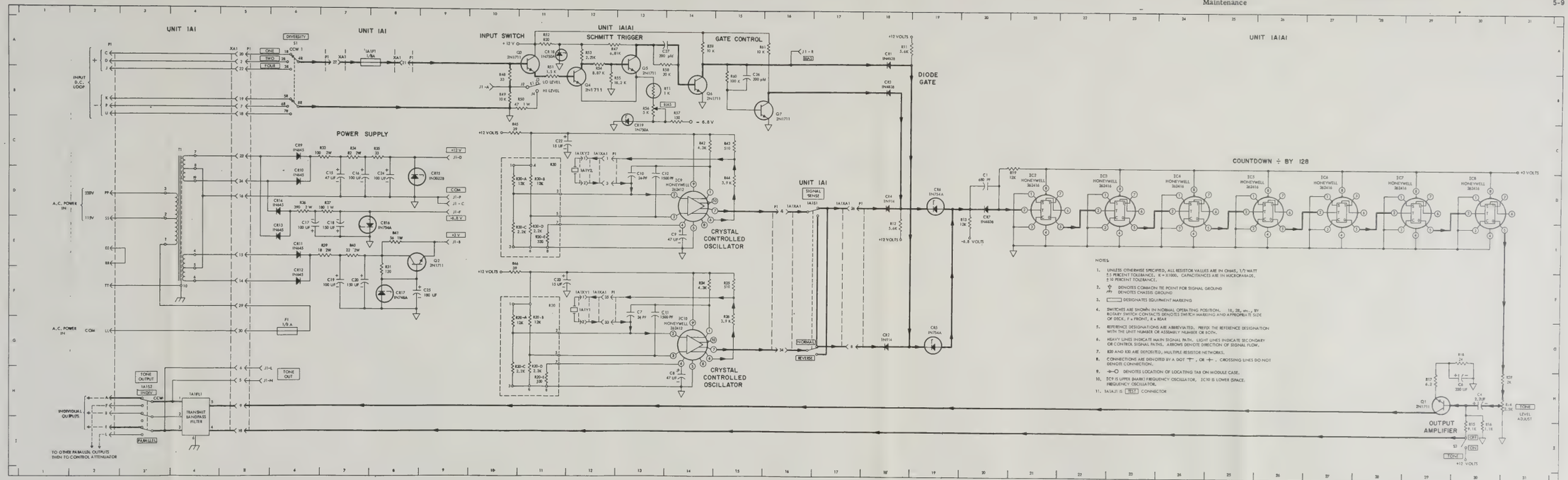


Figure 5-9. Keyer, Frequency Shift KY-558A(P)/UCC-1C(V), Unit 1A1, Schematic Diagram

PART LOCATION INDEX

REFERENCE DESIGNATION	LOCATION
UNIT 1A1	
F1	7A
S1	16D
S2	3H
T1	4C
UNIT 1A1A1	
C1	20D
C4	30H
C6	30H
C7	13F
C8	14H
C9	14E
C10	13D
C11	13F
C12	13D
C15	7D
C16	7D
C17	6E
C18	7E
C19	7F
C20	7F
C22	11C
C23	11F
C24	8D
C25	8F
C26	15A
C26	13, 14A
E1	11B
F1	6G
J1-A	10B
J1-B	9E
J1-C	9D
J1-D	9C
J1-F	9D
J1-L	5H
J1-N	5H
J1-P	9D
J1-R	17A
J2	11B
J3	11B
J4	11B
S1	6A
S2	3H
S3	30I
Q1	29H
Q2	8E
Q3	11A
Q4	12B
Q5	13A
Q6	14B
Q7	16B
S1	6A
S1	6A
S3	30I
CR1	18A
CR2	18G
CR3	18B
CR4	18D
CR5	19G
CR6	19D
CR7	20D
CR9	6C
CR10	6D
CR11	6E
CR12	6F
CR13	6E
CR14	6D
CR15	8D
CR16	8E
CR17	8F
CR18	11A
CR19	13B
R11	18A
R12	18E
R13	20D
R14	31H
R15	30I
R16	30I
R17	29H
R18	30G
R19	21C
R20	11F
R24	14F
R25	15F
R26	15F
R30	11D
R31	8F
R33	7C
R34	7C
R35	8C
R36	6D
R37	7D
R38	31H
R39	7E
R40	7E
R41	8E
R42	14C
R43	15C
R44	15D
R45	16C
R46	10E
R47	12, 13A
R48	10B
R49	10B
R50	11B
R51	11B
R52	11A
R53	12A
R54	12B
R55	12, 13B
R56	13B
R57	14B
R58	13, 14B
R55	12, 13B
R56	13B
R57	14B
R58	13, 14B
R59	14A
R60	15B
R61	15A
RT1	13B
IC2	21D
IC3	23D
IC4	24D
IC5	26D
IC6	27D
IC7	29D
IC8	30D
IC9	14D
IC10	14G



NOTES:

1. UNLESS OTHERWISE SPECIFIED, ALL RESISTOR VALUES ARE IN OHMS, 1/2 WATT ±5 PERCENT TOLERANCE, K = 1000, CAPACITANCES ARE IN MICROFARADS, ±10 PERCENT TOLERANCE.
2. ⏚ DENOTES COMMON TIE POINT FOR SIGNAL GROUND
   ⏚ DENOTES CHASSIS GROUND
3. [ ] DESIGNATES EQUIPMENT MARKING
4. SWITCHES ARE SHOWN IN NORMAL OPERATING POSITION. 1B, 2B, etc., BY ROTARY SWITCH CONTACTS DENOTES SWITCH MARKING AND APPROXIMATE SIZE OF STICK, F = FRONT, R = REAR
5. REFERENCE DESIGNATIONS ARE ABBREVIATED. PREFIX THE REFERENCE DESIGNATION WITH THE UNIT NUMBER OR ASSEMBLY NUMBER OR BOTH.
6. HEAVY LINES INDICATE MAIN SIGNAL PATH. LIGHT LINES INDICATE SECONDARY OR CONTROL SIGNAL PATHS. ARROWS DENOTE DIRECTION OF SIGNAL FLOW.
7. R30 AND R30 ARE DEPOSITED, MULTIPLE RESISTOR NETWORKS.
8. CONNECTIONS ARE DENOTED BY A DOT ┬ OR ┼. CROSSING LINES DO NOT DENOTE CONNECTION.
9. ⊣⊢ DENOTES LOCATION OF LOCATING TAB ON MODULE CASE.
10. IC9 IS UPPER (MARK) FREQUENCY OSCILLATOR, IC10 IS LOWER (SPACE) FREQUENCY OSCILLATOR.
11. 1A1A2J1 IS TEST CONNECTOR

Figure 5-9. Keyer, Frequency Shift KY-558A(P)/UCC-1C(V), Unit 1A1, Schematic Diagram

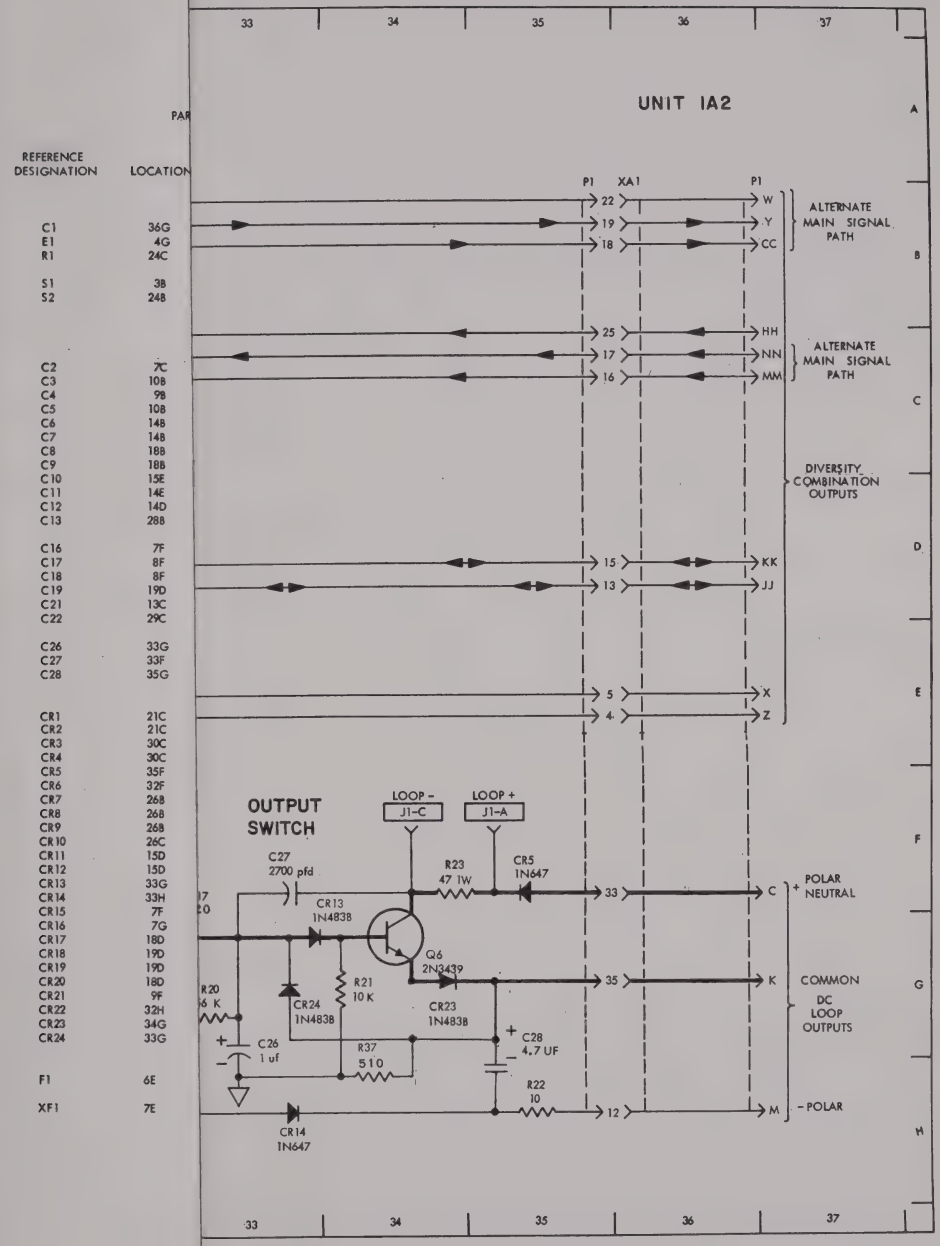
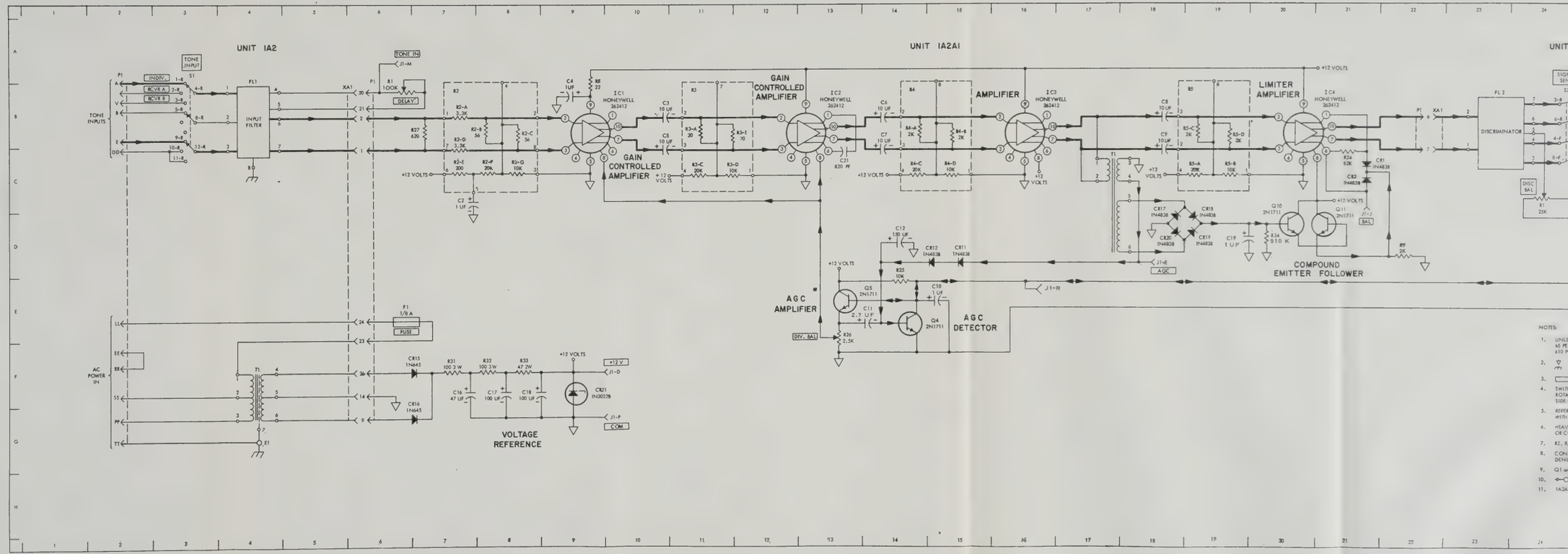


Figure 5-10. Converter, Frequency Shift CV-1920A(P)/UCC-1C(V), Unit 1A2, Schematic Diagram

PART LOCATION INDEX

REFERENCE DESIGNATION	LOCATION	REFERENCE DESIGNATION	LOCATION
UNIT 1A2			
C1	36G	T1	4F
E1	4G		
F1	24C	FL1	4B
		FL2	23B
S1	3B		
S2	23B		
UNIT 1A2A1			
		J1-A	35E
C2	7C	J1-C	34E
C3	10B	J1-D	10F
C4	9B	J1-E	18D
C5	10B	J1-F	28A
C6	14B	J1-J	21C
C7	14B	J1-K	29C
C8	18B	J1-M	6A
C9	18B	J1-P	10G
C10	13E	J1-R	16E
C11	14E	L1	28B
C12	14D	Q3	28G
C13	28B	Q4	15E
		Q5	14E
C16	7F	Q6	34G
C17	8F	Q7	31G
C18	8F	Q8	30G
C19	19D	Q9	32G
C21	13C	Q10	20C
C22	29C	Q11	21C
C26	33G		
C27	33F	R1	6B
C28	35G	R2	7B
		R3	11B
		R4	14B
CR1	21C	R5	19B
CR2	21C	R6	28F
CR3	30C	R8	9B
CR4	30C	R9	22D
CR5	35F	R10	27B
CR6	22F	R11	26C
CR7	26B	R12	26C
CR8	26B	R13	28B
CR9	26B	R14	31D
CR10	26C	R15	31D
CR11	15D	R16	29G
CR12	15D	R17	33F
CR13	33G	R18	30G
CR14	33H	R19	32G
CR15	7F	R20	33G
CR16	7G	R21	34G
CR17	18D	R22	35H
CR18	19D	R23	34F
CR19	19D	R24	21C
CR20	18D	R25	14D
CR21	9F	R26	13E
CR22	32H	R27	7B
CR23	34G	R31	7F
CR24	33G	R32	8F
		R33	8F
		R34	20D
F1	6E	R37	34H
		S1	29B
XF1	7E	T1	17C



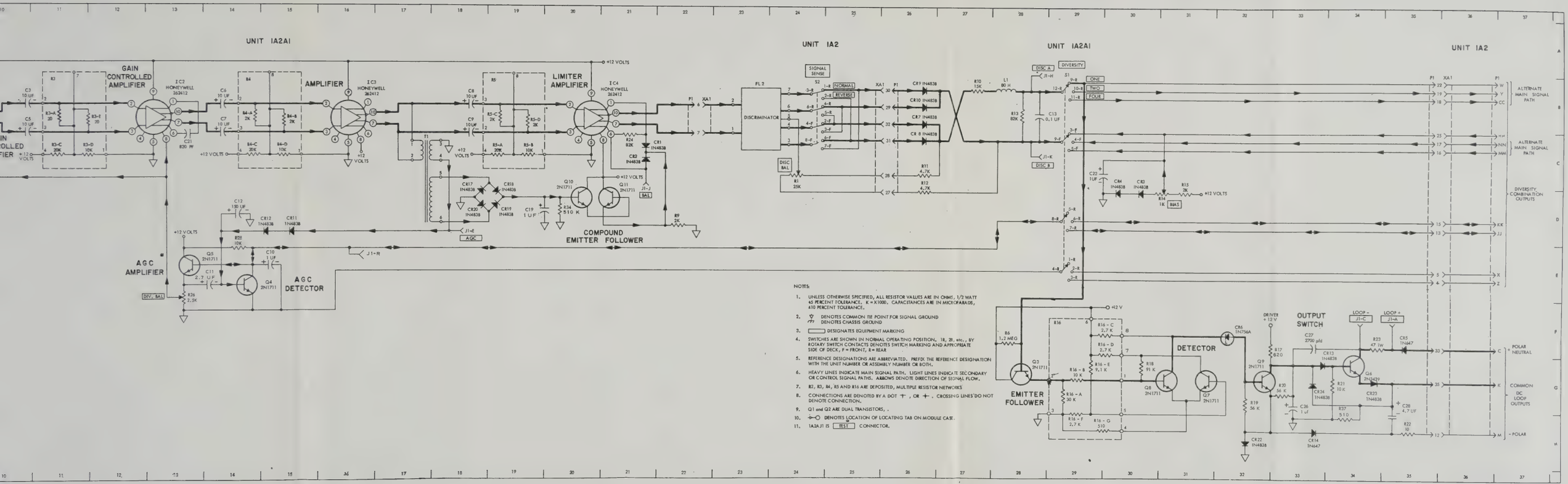


Figure 5-10. Converter, Frequency Shift CV-1920A(P)/UCC-1C(V), Unit 1A2, Schematic Diagram

PART LOCATION INDEX

UNIT 1A3A1

REFERENCE DESIGNATION	LOCATION	REFERENCE DESIGNATION	LOCATION
C1	7A	R4	9A
C2	9B	R5	15A
C3	9B	R6	15B
C4	12B	R7	15B
C5	14B	R8	16B
C6	16B	R9	17A
C7	17B	R10	17B
C8	9F	R11	17B
C9	7F	R12	17C
C10	6F	R13	5C
C11	8G	R14	8G
C12	8G	R15	8G
C13	9G	R16	9G
C14	8B		
C15	15B	S1	6D-
F1	6E	T1	12B
F2	6D		
F3	7D	CR1	13B
J1	D1B	CR2	13B
L1	8E	CR3	7G
P1	5	CR4	7G
Q1	15B	CR5	10G
Q2	17B		
		DS1	8E
R1	5B		
R2	5B	IC1	8B
R3	8A	IC2	11B

UNIT 1A3

REFERENCE DESIGNATION	LOCATION
P1	1
E1	2H
S1	2F
T1	3B
T2	3C
T3	3D
T4	3E
T5	3G
XA1	5-

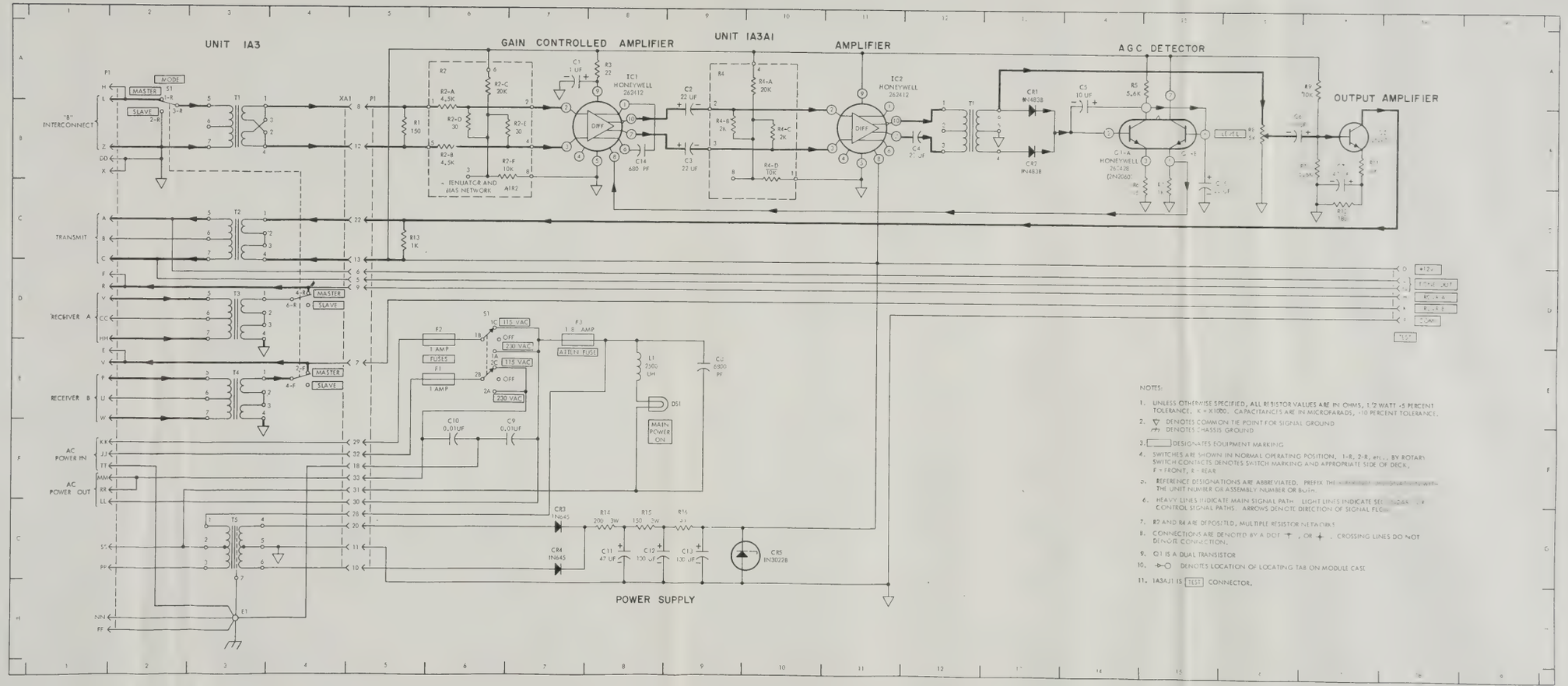

UNIT 1A3
UNIT 1A3A1
GAIN CONTROLLED AMPLIFIER
AMPLIFIER
AGC DETECTOR
OUTPUT AMPLIFIER
"B" INTERCONNECT
TRANSMIT
RECEIVER A
RECEIVER B
AC POWER IN
AC POWER OUT
MODE
MASTER
SLAVE
POWER SUPPLY
MAIN POWER ON
ATTEN FUSE
FUSES
LEVEL
OUTPUT
NOTES:
1. UNLESS OTHERWISE SPECIFIED, ALL RESISTOR VALUES ARE IN OHMS, 1/2 WATT ±5 PERCENT TOLERANCE. K = X1000. CAPACITANCES ARE IN MICROFARADS, ±10 PERCENT TOLERANCE.
2. ▽ DENOTES COMMON TIE POINT FOR SIGNAL GROUND
⏚ DENOTES CHASSIS GROUND
3. ▭ DESIGNATES EQUIPMENT MARKING
4. SWITCHES ARE SHOWN IN NORMAL OPERATING POSITION. 1-R, 2-R, etc., BY ROTARY SWITCH CONTACTS DENOTES SWITCH MARKING AND APPROPRIATE SIDE OF DECK. F = FRONT, R = REAR
5. REFERENCE DESIGNATIONS ARE ABBREVIATED. PREFIX THE ASSEMBLY NUMBER FOR THE UNIT NUMBER OR ASSEMBLY NUMBER OR both.
6. HEAVY LINES INDICATE MAIN SIGNAL PATH. LIGHT LINES INDICATE SECONDARY OR CONTROL SIGNAL PATHS. ARROWS DENOTE DIRECTION OF SIGNAL FLOW.
7. R7 AND R4 ARE DEPOSITED, MULTIPLE RESISTOR NETWORKS
8. CONNECTIONS ARE DENOTED BY A DOT ┼ , OR ┼ . CROSSING LINES DO NOT DENOTE CONNECTION.
9. Q1 IS A DUAL TRANSISTOR
10. ⊸○ DENOTES LOCATION OF LOCATING TAB ON MODULE CASE
11. 1A3AJ1 IS TEST CONNECTOR.

Figure 5-11. Control-Attenuator C-6554A/UCC-1C(V), Unit 1A3, Schematic Diagram

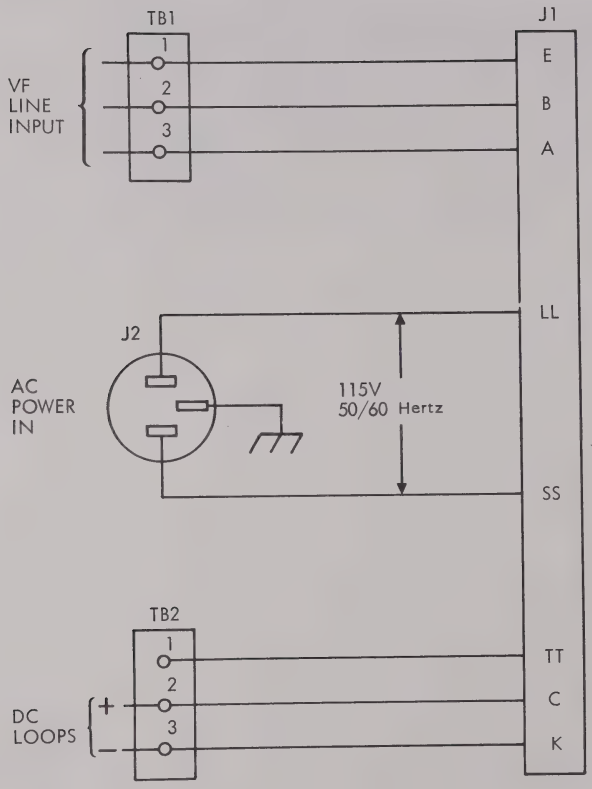


Figure 5-12. Test Adapter, Unit 1A3A2, Schematic Diagram

(Blank)

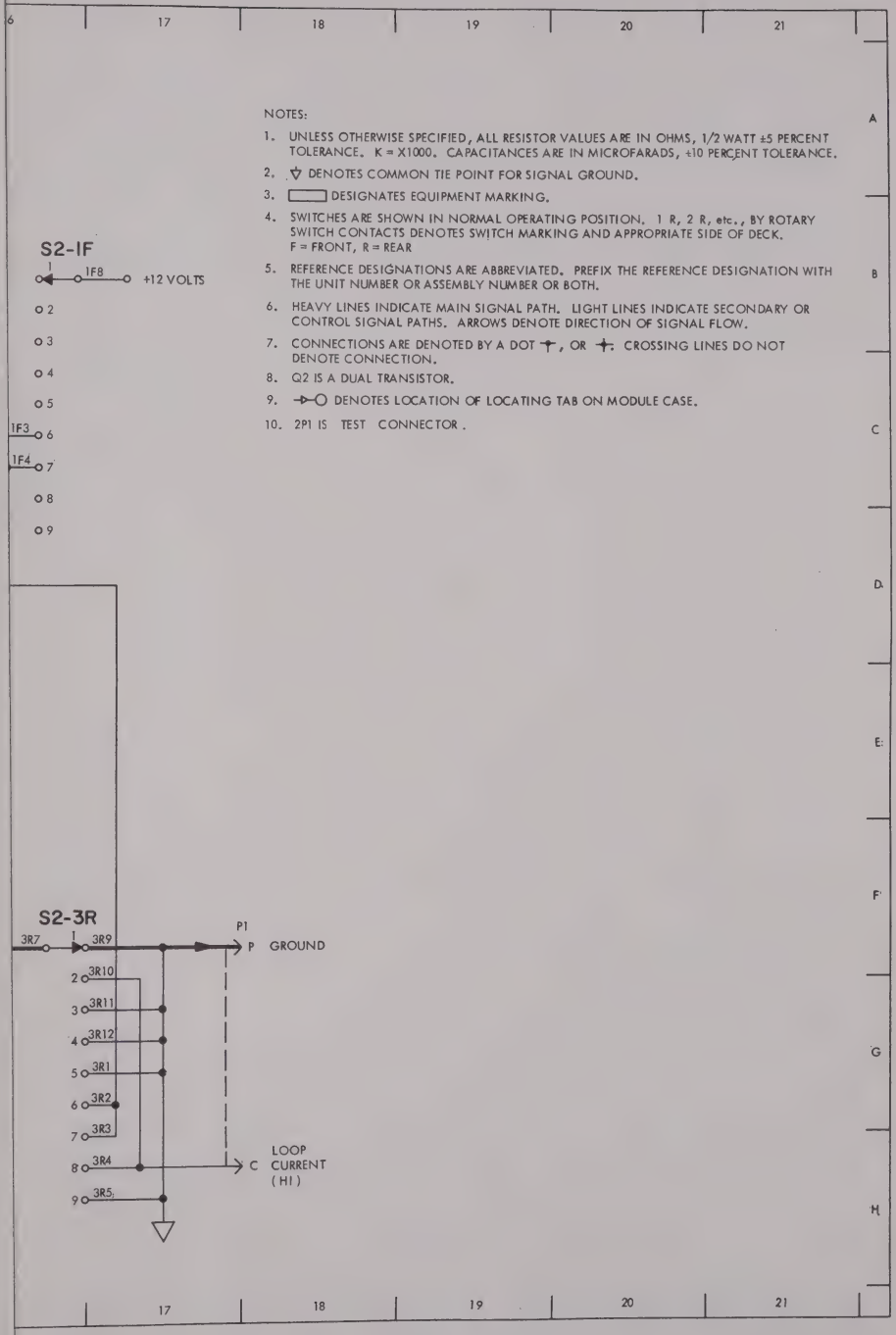
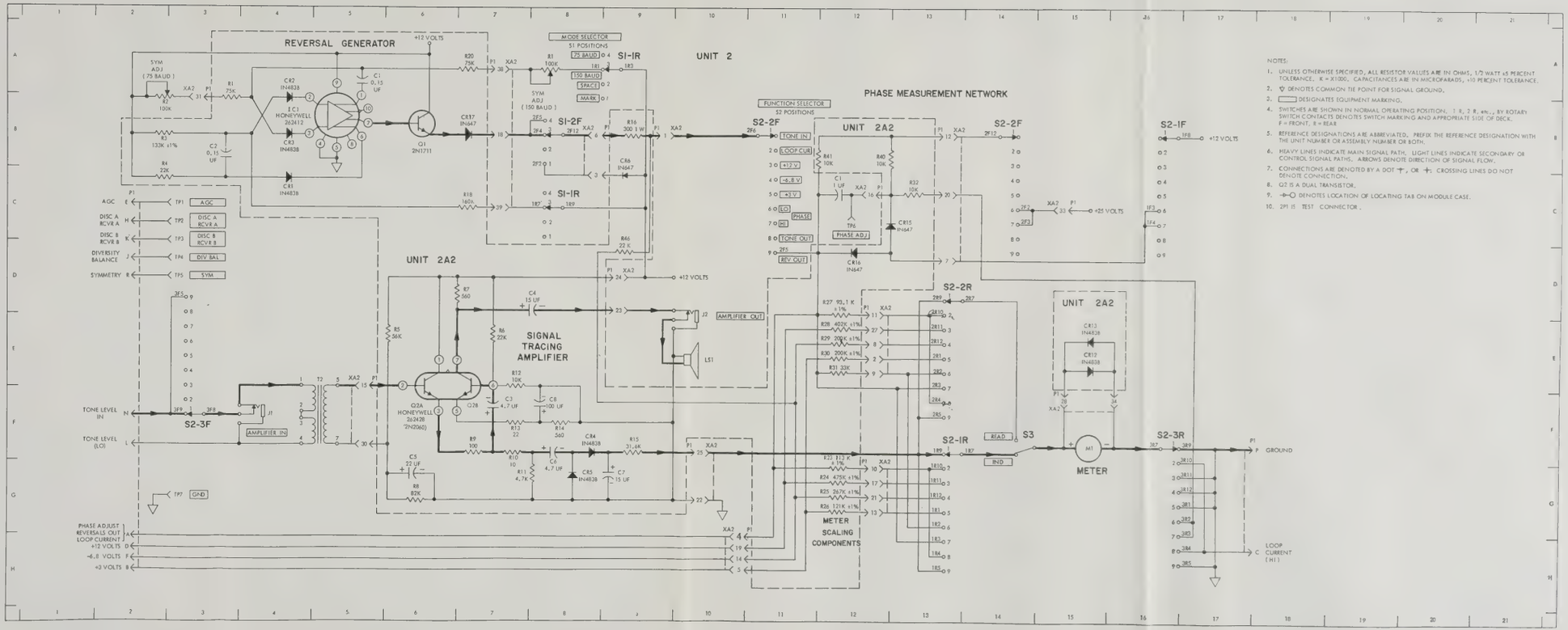


Figure 5-13. Test Set, Telegraph TS-2232A/UCC-1C(V) Unit 2, Schematic Diagram

(Blank)

PART LOCATION INDEX

REFERENCE DESIGNATION	LOCATION	REFERENCE DESIGNATION	LOCATION
	UNIT 2		
C1	12C	S2-C	12F
		S2-D	13D
J1	4F	S2-E	16F
J2	10D	S2-G	16B
		S2-H	14B
LS1	10E		
		S3	14F
M1	15F		
		T2	5F
R1	8A		
R2	2B	TP1	3C
		TP2	3C
S1-A	9A	TP3	3C
S1-B	8C	TP4	3D
S1-C	8B	TP5	3D
		TP6	12C
S2-A	11B	TP7	3G
S2-B	2F		
	UNIT 2A2		
C1	5A	R3	2B
C2	3B	R4	2C
C3	7F	R5	6E
C4	8F	R6	7E
C5	6G	R7	7D
C6	8F	R8	6G
C7	9G	R9	7F
C8	8F	R10	7F
		R11	8G
CR1	4C	R12	7E
CR2	4B	R13	7F
CR3	4B	R14	8F
CR4	8F	R15	9F
CR5	8G	R16	9B
CR6	9C		
		R18	7C
CR12	15E	R20	7A
CR13	15E		
		R23	12G
CR1	13C	R24	12G
CR2	12D	R25	12G
CR17	7B	R26	12G
		R27	12D
IC1	5B	R28	12E
		R29	12E
Q1	6B	R30	12E
		R31	12E
Q2A	6F	R32	13C
Q2B	6F		
		R40	12B
R1	3B	R41	12B
		R46	9D



NOTES:

1. UNLESS OTHERWISE SPECIFIED, ALL RESISTOR VALUES ARE IN OHMS, 1/2 WATT ±5 PERCENT TOLERANCE. K = X1000, CAPACITANCES ARE IN MICROFARADS, ±10 PERCENT TOLERANCE.
2. ▽ DENOTES COMMON TIE POINT FOR SIGNAL GROUND.
3. ▭ DESIGNATES EQUIPMENT MARKING.
4. SWITCHES ARE SHOWN IN NORMAL OPERATING POSITION. 1 R, 2 R, etc., BY ROTARY SWITCH CONTACTS DENOTES SWITCH MARKING AND APPROPRIATE SIDE OF DECK. F = FRONT, R = REAR.
5. REFERENCE DESIGNATIONS ARE ABBREVIATED. PREFIX THE REFERENCE DESIGNATION WITH THE UNIT NUMBER OR ASSEMBLY NUMBER OR BOTH.
6. HEAVY LINES INDICATE MAIN SIGNAL PATH. LIGHT LINES INDICATE SECONDARY OR CONTROL SIGNAL PATHS. ARROWS DENOTE DIRECTION OF SIGNAL FLOW.
7. CONNECTIONS ARE DENOTED BY A DOT ┼, OR ┼ CROSSING LINES DO NOT DENOTE CONNECTION.
8. Q2 IS A DUAL TRANSISTOR.
9. ⊣⊢ DENOTES LOCATION OF LOCATING TAB ON MODULE CASE.
10. 2P1 IS TEST CONNECTOR.

Original

Figure 5-13. Test Set, Telegraph TS-2232 A/UCC-1C(V) Unit 2, Schematic Diagram

5-27-5-28

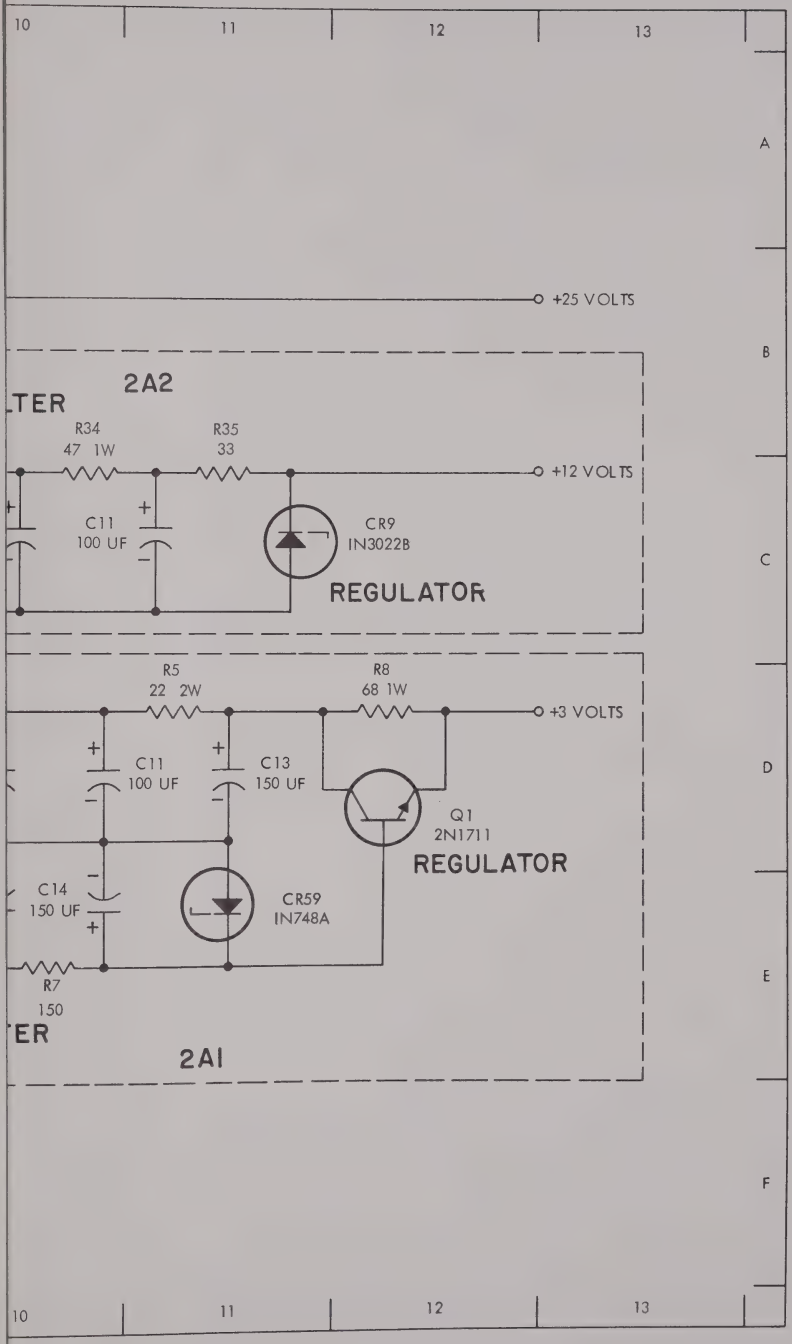
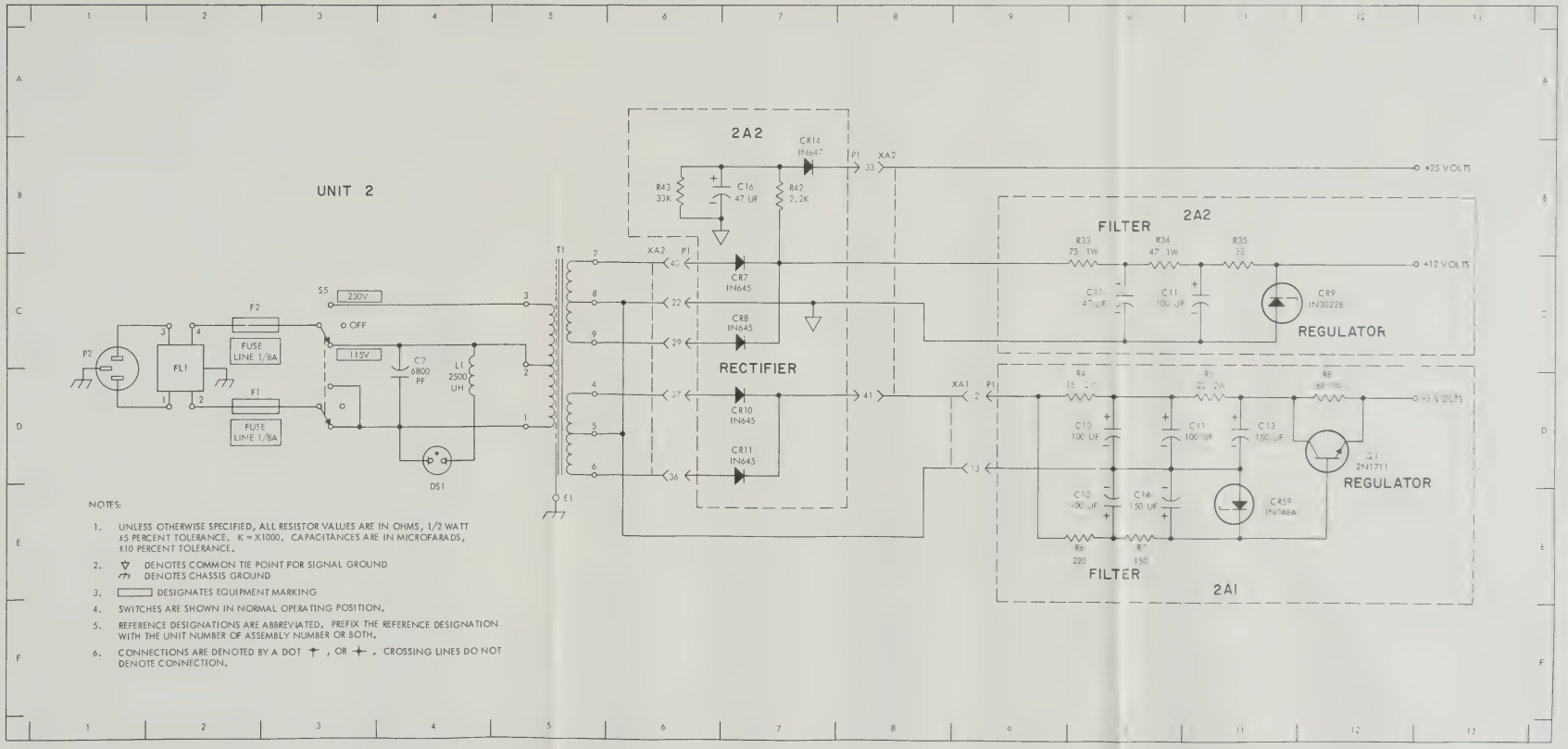


Figure 5-14. Test Set Power Supply Circuits, Unit 2, Schematic Diagram

PART LOCATION INDEX

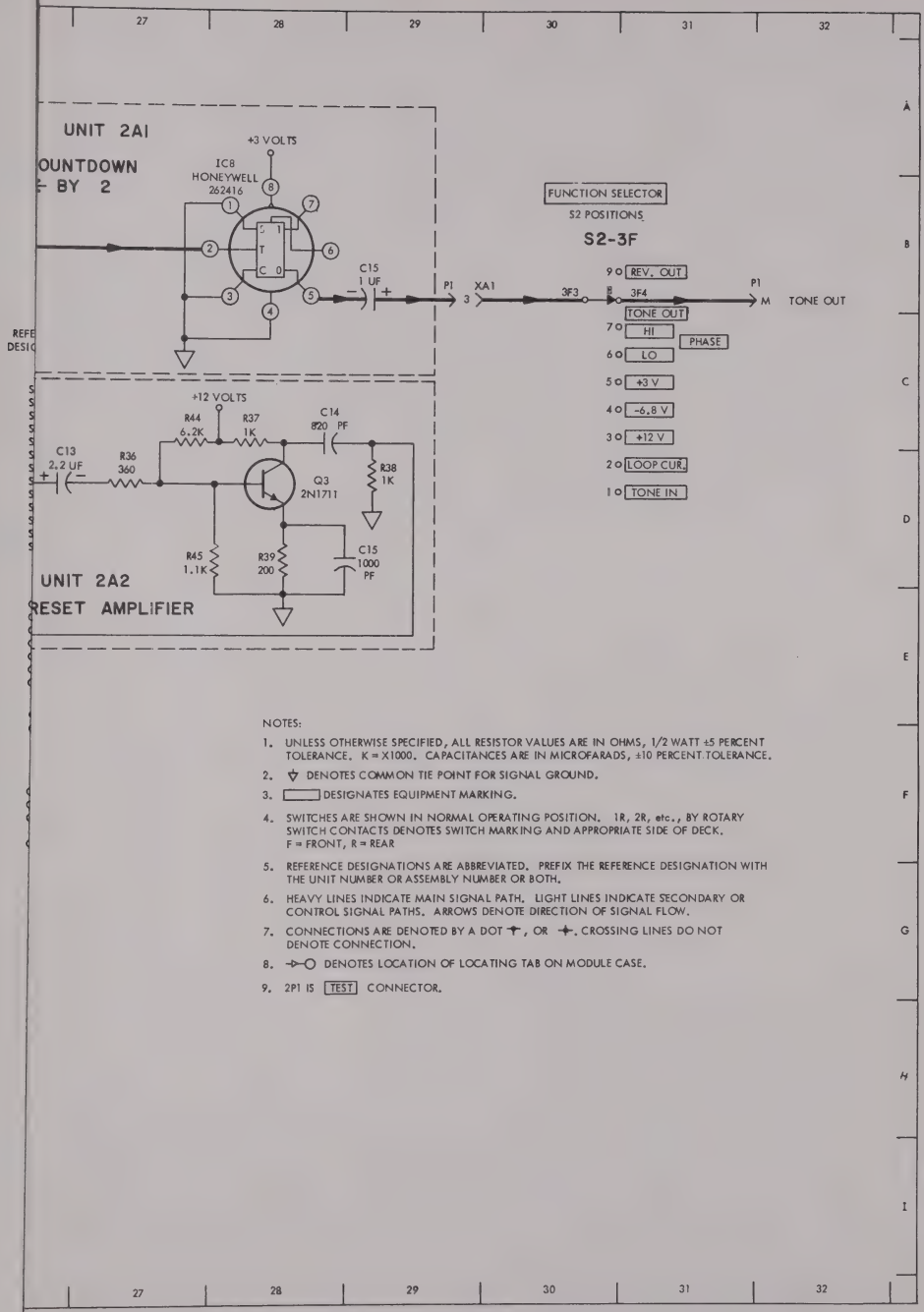
REFERENCE DESIGNATION	LOCATION
UNIT 2	
C1	C4
E1	5E
F1	2D
F2	2C
L1	4C
P2	1C
S5	3C
T1	5C
DS1	4D
FL1	2C
2A1	
C10	10D
C11	11D
C12	10E
C13	11D
C14	10E
Q1	12D
R4	10D
R5	11D
R6	10E
R7	10E
R8	12D
CR59	11E
2A2	
C10	10C
C11	11C
C16	7B
R33	10C
R34	10C
R35	11C
R42	7B
R43	6B
CR7	7C
CR8	7C
CR9	11C
CR10	7D
CR11	7E
CR14	7B



NOTES:

1. UNLESS OTHERWISE SPECIFIED, ALL RESISTOR VALUES ARE IN OHMS, 1/2 WATT ±5 PERCENT TOLERANCE. K = X1000. CAPACITANCES ARE IN MICROFARADS, ±10 PERCENT TOLERANCE.
2. ▽ DENOTES COMMON TIE POINT FOR SIGNAL GROUND
   ⏚ DENOTES CHASSIS GROUND
3. ▭ DESIGNATES EQUIPMENT MARKING
4. SWITCHES ARE SHOWN IN NORMAL OPERATING POSITION.
5. REFERENCE DESIGNATIONS ARE ABBREVIATED. PREFIX THE REFERENCE DESIGNATION WITH THE UNIT NUMBER OF ASSEMBLY NUMBER OR BOTH.
6. CONNECTIONS ARE DENOTED BY A DOT ┼ , OR ┼ , CROSSING LINES DO NOT DENOTE CONNECTION.

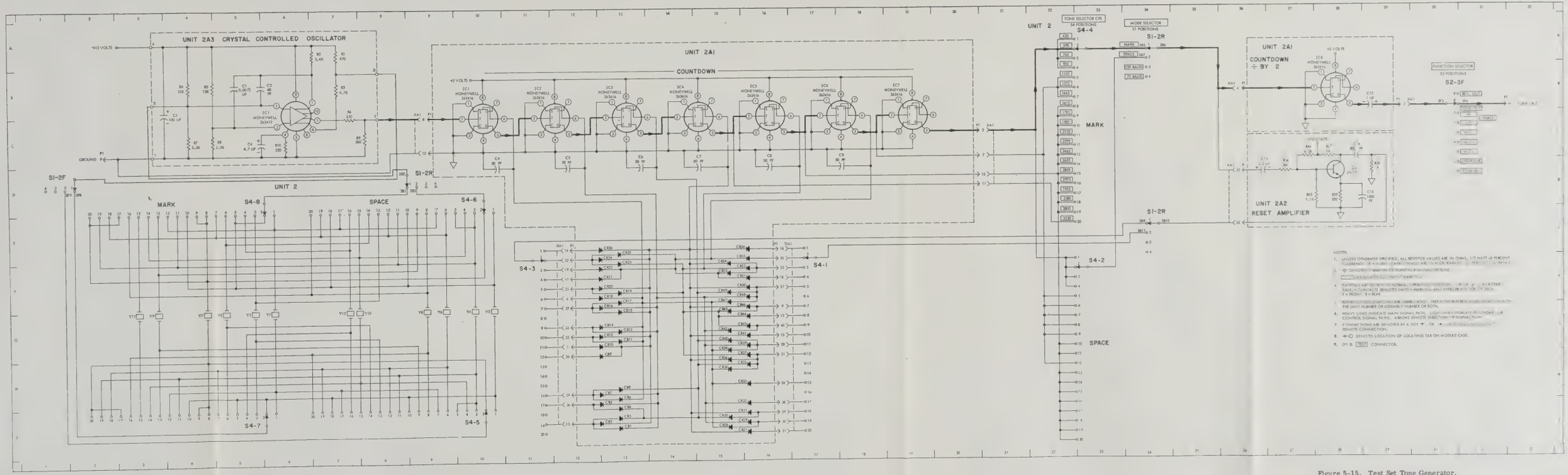
Figure 5-14. Test Set Power Supply Circuits, Unit 2, Schematic Diagram



NOTES:

1. UNLESS OTHERWISE SPECIFIED, ALL RESISTOR VALUES ARE IN OHMS, 1/2 WATT ±5 PERCENT TOLERANCE. K = X1000. CAPACITANCES ARE IN MICROFARADS, ±10 PERCENT TOLERANCE.
2. ▽ DENOTES COMMON TIE POINT FOR SIGNAL GROUND.
3. ▭ DESIGNATES EQUIPMENT MARKING.
4. SWITCHES ARE SHOWN IN NORMAL OPERATING POSITION. 1R, 2R, etc., BY ROTARY SWITCH CONTACTS DENOTES SWITCH MARKING AND APPROPRIATE SIDE OF DECK. F = FRONT, R = REAR
5. REFERENCE DESIGNATIONS ARE ABBREVIATED. PREFIX THE REFERENCE DESIGNATION WITH THE UNIT NUMBER OR ASSEMBLY NUMBER OR BOTH.
6. HEAVY LINES INDICATE MAIN SIGNAL PATH. LIGHT LINES INDICATE SECONDARY OR CONTROL SIGNAL PATHS. ARROWS DENOTE DIRECTION OF SIGNAL FLOW.
7. CONNECTIONS ARE DENOTED BY A DOT ⊢, OR ⊣⊢. CROSSING LINES DO NOT DENOTE CONNECTION.
8. ⊣▷○ DENOTES LOCATION OF LOCATING TAB ON MODULE CASE.
9. 2P1 IS [TEST] CONNECTOR.

Figure 5-15. Test Set Tone Generator, Unit 2, Schematic Diagram



PART LOCATION INDEX

REFERENCE DESIGNATION	LOCATION	REFERENCE DESIGNATION	LOCATION
UNIT 2			
S1-B	9D	Y1	6G
S1-E	11D	Y2	10G
S1-H	24A	Y3	5G
S1-K	34E	Y4	10G
S2-F	30B	Y5	5G
S4-A	5D	Y6	9G
S4-B	5I	Y7	4G
S4-C	16D	Y8	9G
S4-D	16A	Y9	3G
S4-E	28A	Y10	8G
S4-F	11F	Y11	3G
S4-G	23F	Y12	7G
S4-H	17F		
UNIT 2A1			
C4	10D	2C1	10B
C5	13D	2C2	11B
C6	13D	2C3	13B
C7	15D	2C4	14B
C8	34D	2C5	16B
C9	18D	2C6	17B
C10	20B	2C7	19B
		2C8	28B

C31 THROUGH C56 SECTION 13 BOTTOM TO TOP.
C427 THROUGH C456 SECTION 16 BOTTOM TO TOP.

UNIT 2A2			
C12	26D	R36	27D
C13	29C	R37	28C
C14	29D	R38	29C
		R39	28D
Q3	28D	R44	27C
		R45	28D
UNIT 2A3			
C1	5B	P1	7A
C2	6B	R2	2A
C4	3C	R3	7B
C5	4B	R4	4B
		R5	4B
IC1	6B	R6	7B
		R7	6C
		R8	5C
		R9	7C
		P10	6C

Original

Figure 5-15. Test Set Tone Generator, Unit 2, Schematic Diagram

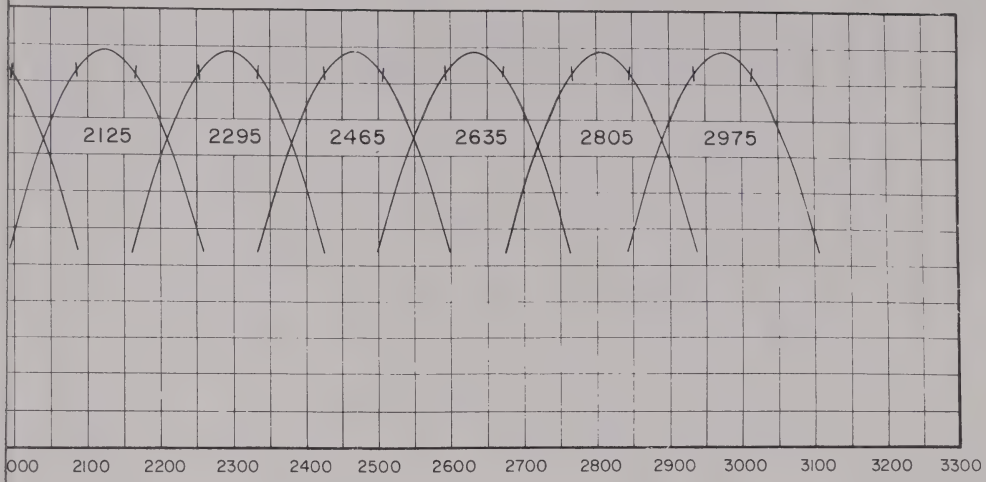


Figure 5-16. Narrow-Band Keyer Filter Curves

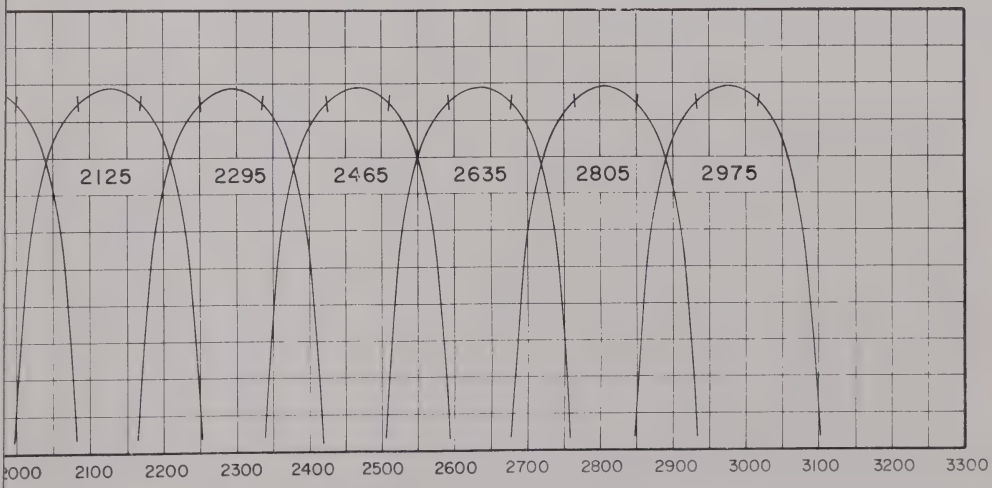


Figure 5-17. Narrow-Band Converter Filter Curves

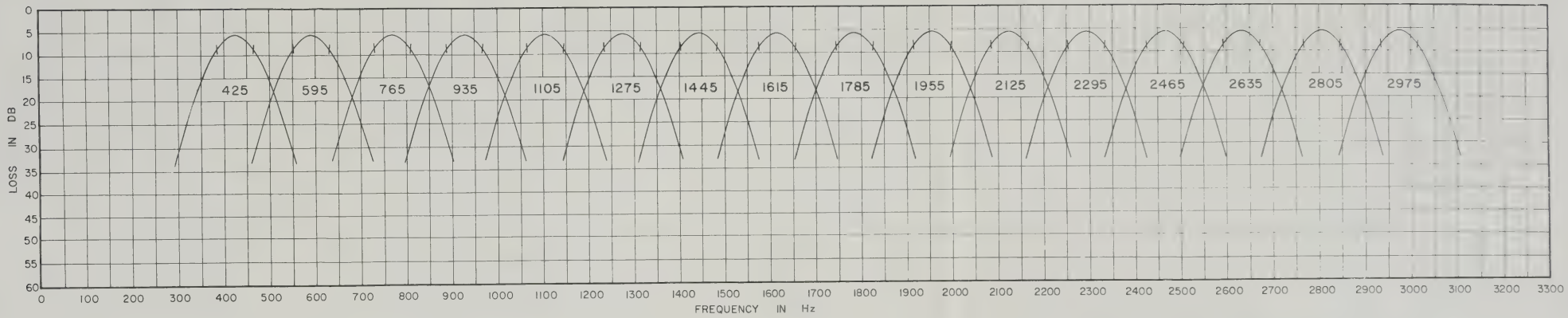


Figure 5-16. Narrow-Band Keyer Filter Curves

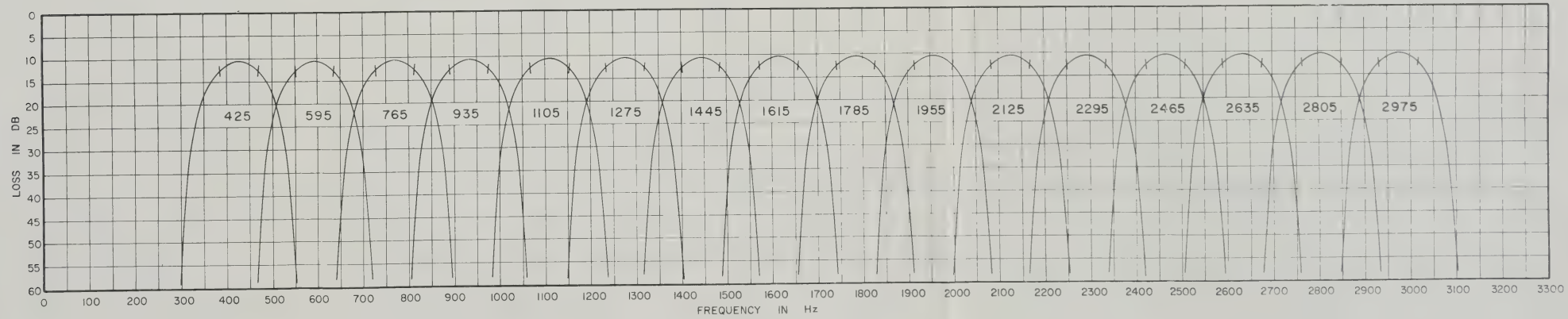
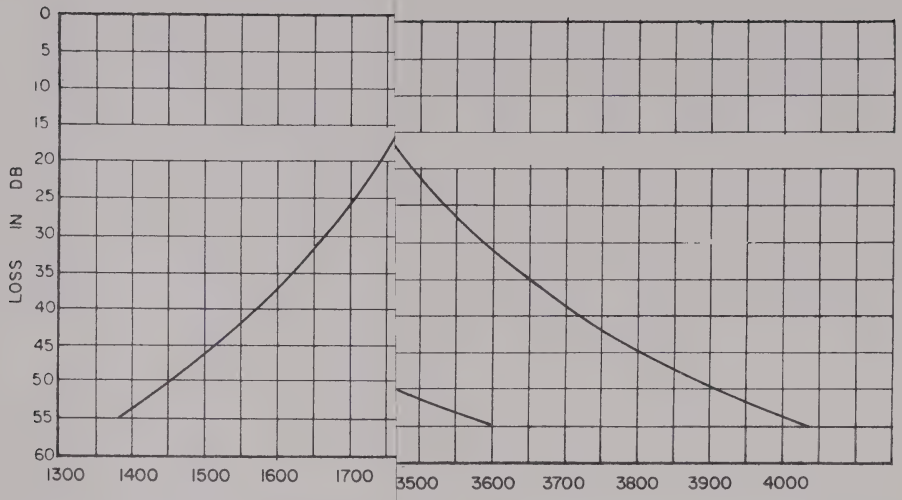
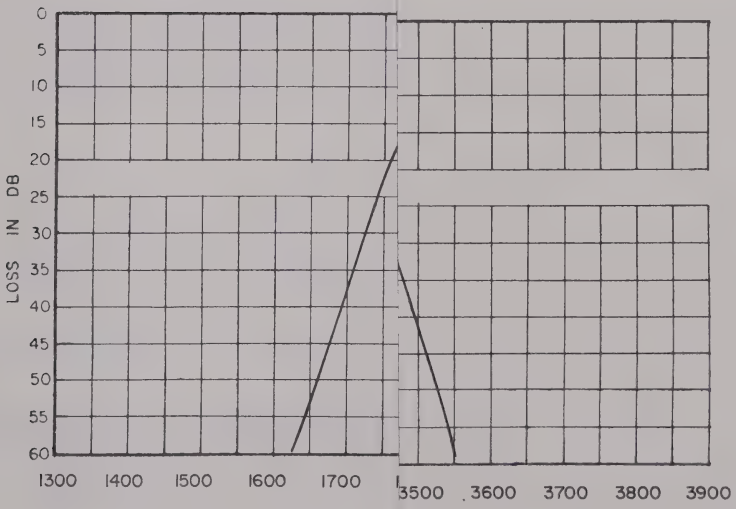


Figure 5-17. Narrow-Band Converter Filter Curves



d Keyer Filter Curves



Converter Filter Curves

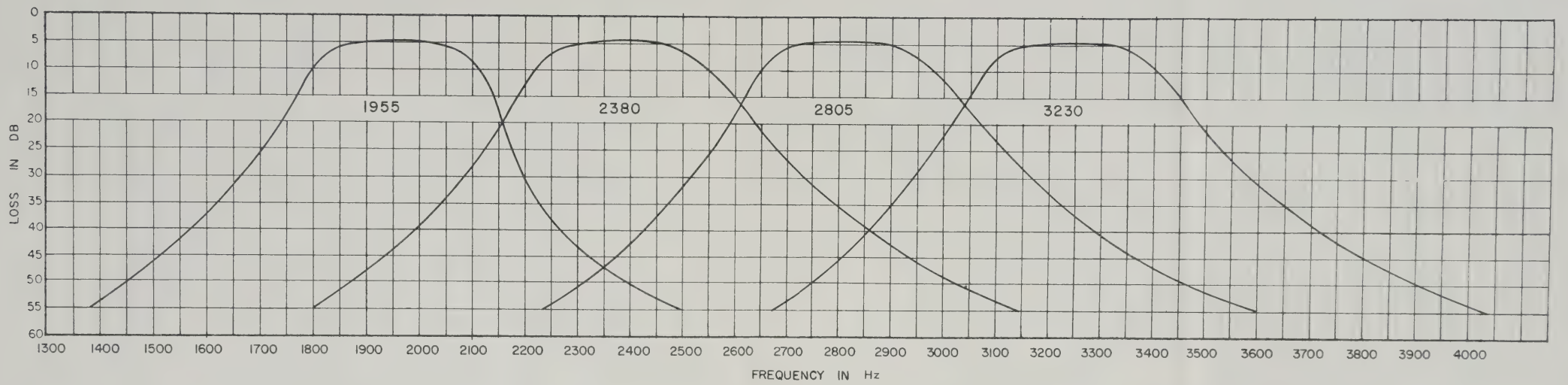


Figure 5-18. Wide-Band Keyer Filter Curves

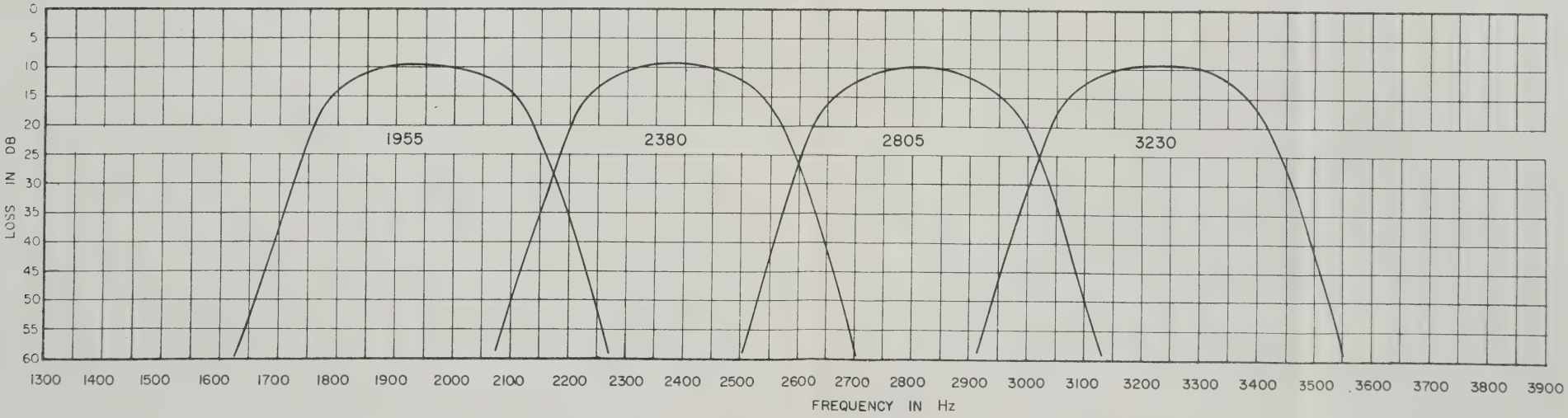


Figure 5-19. Wide-Band Converter Filter Curves

b. BIAS ADJUSTMENT. Perform the procedure described in Paragraph 2-4.

5-6. TEST SET ADJUSTMENT.

The Test Set requires no adjustment except the reversal generator frequency. To make this adjustment, proceed as follows:

a. Remove four screws from the Test Set front panel and remove the chassis from the enclosure.
b. Connect the common lead of the oscilloscope to pin P of the test cable connector.
c. Connect the signal input lead of the oscilloscope to pin A of the test cable connector.
d. Set the FUNCTION switch to REV. OUT.
e. Set the MODE switch to 75 BAUD.
f. Observe the oscilloscope display and adjust R2 to obtain a zero bias error.

Note

Zero bias error is obtained when durations of positive and negative excursions are the same.

g. Set the MODE switch to 150 BAUD.
h. Observe the oscilloscope display and adjust R1 to obtain a zero bias error.
i. Replace the chassis in the enclosure and replace the four screws.

5-7. PROCEDURES FOR REPLACING SEMICONDUCTOR DEVICES AND REPAIRING PRINTED CIRCUIT CARDS.

Component parts of the Telegraph Terminal can be reached easily and replaced. To avoid damage to semiconductor devices (integrated circuits, transistors, diodes) and printed-circuit cards, carefully follow the special procedures described in paragraphs 5-8 and 5-9.

5-8. SEMICONDUCTOR REPLACEMENT TECHNIQUES.

a. Extremely sensitive to heat, semiconductor devices are destroyed if subjected to excessive temperatures for even short periods of time. For this reason, the soldering technique used in replacement is extremely important. Whenever possible, use a low-power soldering iron, preferably 25 to 35 watts. Provide a heat sink of some sort between the soldering iron and the transistor lead.

This is easily done by grasping the lead being soldered (using long-nose pliers) just above the point of soldering iron contact. The pliers will dissipate excess heat before it is conducted to the device. Use of a heat sink is essential, and should be employed whenever a soldering iron contacts a lead of an integrated circuit device, a transistor or a diode.

b. Apply the soldering iron to the lead only long enough to melt the solder. Never bring the soldering iron into contact with the body of the device, or metal that is in direct contact with the body of the semiconductor device.

c. Transistor connection points on the printed-circuit card are not keyed. To avoid the possibility of inserting the substitute transistor backwards (which would reverse the connections to the emitter and collector), mark the emitter-terminal connection point on the printed-circuit card, before removing the transistor. Refer to figures 5-1 through 5-3 and 5-5 through 5-7 for the location of transistors and integrated circuit devices on the circuit cards. A mark on the circuit card is aligned with the metal tab on the body of each integrated circuit device.

d. Some soldering irons, when plugged into the a-c line, have a voltage existing between the metal body of the iron and earth ground. This voltage causes leakage currents that can seriously damage a transistor when the iron is brought into contact with the transistor lead. Such effects can be nullified by connecting a jumper lead from the metal body of the iron, to the ground point of the printed-circuit card being repaired.

5-9. PRINTED-CIRCUIT REPAIR TECHNIQUES.

Printed-circuit repair is more difficult and requires more skill than conventional-equipment repair. The following discussion describes acceptable procedures for replacing components and servicing printed-circuit cards, and identifies the tools and materials required for performing these procedures. Read these instructions carefully before attempting any printed circuit repair: follow them scrupulously while performing any repair.

a. GENERAL. - Since the cost of a printed-circuit card is high, particularly when compared with that of an individual component, never try to save the component at the expense of a printed-circuit card. Most components may be clipped from the card, thereby protecting the card's printed-circuit conductor (i.e., the copper foil beneath the visible solder coating) and preventing any undue component damage. In using the soldering iron to remove the leads of a clipped-off component, to connect a new component, or to repair the printed-circuit card itself, take care when applying the iron to the printed-circuit card. These cards are easily damaged by heat; prolonged application of heat destroys the adhesiveness of the bonding agent that holds the printed conductor to the card.

b. SPECIAL EQUIPMENT REQUIRED. -

(1) Pencil-type soldering iron, 35 watts maximum, 3/16-inch diameter tip
(2) Small twist drills, numbers 30 through 60
(3) Flush-cutting diagonal pliers
(4) Needle-nose pliers
(5) One-half inch brush
(6) Liquid Rosin Flux (MIL-F-14256)
(7) Alcohol
(8) Knife
(9) Wooden toothpicks
(10) Stranded wire No. 20 or 22 AWG, (19 strand preferred)

c. REMOVING A DEFECTIVE COMPONENT.

(1) CLIPPING OUT THE COMPONENT. - Using the diagonal pliers, cut (close to the lead hole, but allowing some of the lead to extend through the hold) both leads of the component, and remove the component. Carefully straighten the lead end that extends through each hole, so that it may be easily withdrawn as described in (2) below.

(2) UNSOLDERING LEAD ENDS. -

CAUTION

Remove solder by wicking only.

(a) Strip about 1/2 inch of insulation from a piece of stranded wire.
(b) Dip bare wire into liquid flux.
(c) Place fluxed wire on solder connection and place soldering iron tip on top of wire.
(d) Remove tip and wire simultaneously, as soon as the desired amount of solder has wicked into the stranded wire.
(e) Place the jaws of the needle-nose pliers along the sides of lead at interface with pad area, turn slightly, lead will come loose easily, lift out of hole. Do not twist lead. If lead is not loose, repeat steps (a) through (e).

(3) CLEANING LEAD HOLE. -

CAUTION

Never use a drill to clean a hole; it may damage the through-board plating.

If it becomes necessary to clean a lead hole, heat the solder briefly and clean out the hole with a wooden toothpick. Spinning the toothpick between the fingers is suggested.

d. INSTALLING NEW COMPONENT. -

(1) Using the knife, scrape the leads of the component to be installed.
(2) Bend the leads so that they fit snugly into the holes where the component is to be installed. Mount the component on the card, gently pushing the leads through the holes. Bend each end of the lead close to the foil.

Note

Apply solder sparingly in the next step. Excess solder may flow between conductors on the card causing a short circuit.

(3) Apply flux to the joint. Touch the lead with the tip of the hot soldering iron, and apply a small amount of fluxless 60/40 solder to the junction.
(4) Remove the soldering iron as soon as solder flows into the joint. Hold the component firmly until the solder sets.
(5) Using a small amount of alcohol, remove excess flux.
(6) Once the solder cools, check that the joint is secure and clean. Remove any excess solder.

e. REPAIRING PRINTED-CIRCUIT CONDUCTOR. - The printed-circuit conductor is, essentially, the thin copper foil which effects required connections to the circuit components; it is bonded to the card proper and is covered by a solder coating. Although the printed-circuit conductor can withstand proper handling and will operate with no trouble under normal rated service condition, it is liable to damage. Should any part of the conductor be damaged (i.e., split or raised from the card proper), perform required repairs as follows:

CAUTION

Before drilling through the card as instructed in step (3) below, make sure that a foil conductor on one side of the card will not be short-circuited to a foil conductor on the other side.

(1) When part of the conductor has raised from the card, remove it by snipping both its ends, close to the card; a split in the conductor does not require cutting.
(2) Bend a piece of tinned 20- or 22-gauge copper wire into the shape of a staple. The staple should be long enough to span the defective portion of the conductor and to allow clinching at approximately one-fourth of an inch from either end. Once placed in position on the printed-circuit card.
(3) From the printed-circuit side of the card, drill two small holes (of proper size) to receive the ends of staple. Unless the printed-circuit conductor is approximately one-fourth of an inch wide, do not drill these holes directly into the foil, but drill them near enough so that the staple is parallel to the foil. Should the foil be one-fourth of an inch wide, drill the two holes directly into the

printed circuit foil. If the repair is not in a congested printed-circuit area, proceed to step (4) below. Otherwise, insert the staple from the component side of the card, and, on the other side, clinch each end diagonally across the printed-circuit conductor. Then proceed to step (5), below.

(4) If room permits, drill two extra holes in the printed-circuit card, each one adjacent to the one of the previously drilled holes. From the printed-circuit side of the card, insert the staple ends into the holes furthest from the area under repair. Holding the staple flush against the card, bend each end back through to the adjacent hole closest to it. Pulling it taut, clinch each lead end across the printed-circuit conductor.

(5) Solder the two joints as described in paragraph d, above.

SECTION 6

PARTS LIST

6-1. INTRODUCTION.

The unit designation method of MIL-STD-16 has been used to assign reference designations which identify all maintenance parts of the equipment. They are used for marking the equipment (adjacent to the part they identify), with the exception of parts located on printed-circuit cards. No reference designations are marked on printed circuit cards; parts location diagrams in Section 5 identify all parts mounted on printed circuit cards. The "letter(s)" of a reference designation indicate(s) the kind of part (generic group), such as resistor, capacitor, transistor, integrated circuit device, etc. The letters "IC," which are not included in MIL-STD-16, have been adopted to stand for "integrated-circuit device" generic group. In each major unit, parts of one generic group are numbered consecutively, beginning with "1" and continuing to the total number contained in that unit. Sockets associated with a particular plug-in device, such as a lamp or a fuse, are identified by a reference designation which includes the reference designation of the plug-in device; for example, the socket for fuse F1 is designated XF1.

The five-digit parenthetical number at the end of the short-part description is the code, per Federal Cataloging Handbook H4-2, identifying the manufacturer. (See Table 6-3.)

6-2. NOTES

The following notes provide information as referenced in Table 6-2

1. 262412-1 optional
2. Part number per MIL-C-5D, 5 August 1966; corresponding numbers on Equipment Drawings and Provisioning List per MIL-C-5C, 19 November 1963.

TABLE 6-1. LIST OF UNITS AND ASSEMBLIES

UNIT NO.	* QTY	NAME OF UNIT	DESIGNATION	COLLOQUIAL NAME	PAGE
1		Cabinet, Electrical Equipment	CY-4639 A/UCC-1C(V)	Cabinet	6-3
1A1		Keyer, Frequency Shift	KY-558 A(P)/UCC-1C(V)	Keyer	6-4
1A1		Keyer Chassis Assembly, Rear		Keyer Rear Chassis	6-4
1A1A1		Keyer Chassis Assembly, Front		Keyer Front Chassis	6-7
1A2		Converter, Frequency Shift	CV-1920 A(P)/UCC-1C(V)	Converter	6-11
1A2		Converter Chassis Assembly, Rear		Converter Rear Chassis	6-11
1A2A1		Converter Chassis Assembly, Front		Converter Front Chassis	6-14
1A3		Control-Attenuator	C-6554 A/UCC-1C(V)	Control-Attenuator	6-17
1A3		Control-Attenuator Chassis Rear		Control-Attenuator Rear Chassis	6-17
1A3A1		Control-Attenuator Chassis, Front		Control-Attenuator Front Chassis	6-17
1A3A2		Test Adapter		Test Adapter	6-19
2		Test Set, Telegraph	TS-2232 A/UCC-1C(V)	Test Set	6-19
2A1		Card Assembly, Counter		Counter Card	6-21
2A2		Card Assembly, Amplifier		Amplifier Card	6-24
2A3		Card Assembly, Oscillator		Oscillator Card	6-29

*Variable

TABLE 6-2. TELEGRAPH TERMINAL AN/UCC-1D(V), MAINTENANCE PARTS LIST

CABINET, ELECTRICAL EQUIPMENT CY-4639A/UCC-1C(V), UNIT 1

REFERENCE DESIGNATION	NOTES	NAME AND DESCRIPTION	FIGURE NUMBER
1		CABINET, ELECTRICAL EQUIPMENT: houses 1 control-attenuator and 8 keyers, frequency shift or 8 converters, frequency shift or a combination thereof: provides sockets for plug-in units, inter-unit wiring, and external connectors: 37264577 (01534)	2-6
1FL1		FILTER, LINE: radio-frequency interference: 262447-1 (01534)	2-9
1J1		CONNECTOR: MIL type MS3112E12-3P (96906)	
1J2		CONNECTOR: MIL type MS3112E12-3S (96906)	
1J3		CONNECTOR: MIL type MS3112E14-5P (96906)	
1J4		CONNECTOR: MIL type MS3112E8-4P (96906)	
1J5		Same as 1J4	
1J6		CONNECTOR: MIL type MS3112E12-10P (96906)	
1J7		Same as 1J6	
1J8		CONNECTOR: MIL type MS3112E14-19P (96906)	
1J9		CONNECTOR: MIL type MS3112E16-26P (96906)	
1XA1		CONNECTOR, ELECTRICAL: 38 pin contacts: 37264728-002 (01534)	
1XA2		Same as 1XA1	
1XA3		Same as 1XA1	
1XA4		Same as 1XA1	
1XA5		Same as 1XA1	
1XA6		Same as 1XA1	
1XA7		Same as 1XA1	
1XA8		Same as 1XA1	
1XA9		Same as 1XA1	2-9

TABLE 6-2. TELEGRAPH TERMINAL AN/UCC-1D(V), MAINTENANCE PARTS LIST (Continued)

KEYER, FREQUENCY SHIFT, KY-558A(P)/UCC-1C(V), UNIT 1A1

REFERENCE DESIGNATION	NOTES	NAME AND DESCRIPTION	FIGURE NUMBER
1A1		KEYER, FREQUENCY SHIFT: one channel (tone keyer) which accepts d-c telegraph signals and transmit frequency shift keying signal, switching to high level 60 to 20 ma neutral or low level polar loop operation, switching to connect two modules; consists of keyer chassis assembly, rear and keyer chassis assembly, front: 37264509 (01534)	2-16
1A1-XX		KEYER CHASSIS ASSEMBLY, REAR: plugs into cabinet, electric equipment; accepts plug-in keyer chassis assembly, front, contains channel frequency determining components; part number varies with operating frequency.	
		Frequency (Hz) — Part No.	
1A1-1		425 — 37264518-1	
1A1-2		595 — 37264518-2	
1A1-3		765 — 37264518-3	
1A1-4		935 — 37264518-4	
1A1-5		1105 — 37264518-5	
1A1-6		1275 — 37264518-6	
1A1-7		1445 — 37264518-7	
1A1-8		1615 — 37264518-8	
1A1-9		1785 — 37264518-9	
1A1-10		1955 — 37264518-10	
1A1-11		2125 — 37264518-11	
1A1-12		2295 — 37264518-12	
1A1-13		2465 — 37264518-13	
1A1-14		2635 — 37264518-14	
1A1-15		2805 — 37264518-15	
1A1-16		2975 — 37264518-16 (01534)	
1A1F1		FUSE, CARTRIDGE: MIL type F02A250V 1/8A (81349)	
1A1FL1-1		FILTER, BANDPASS: audio-frequency, 600 ohms impedance; 425 ±42.5 Hz; 262413-1 (01534)	
1A1FL1-2		FILTER, BANDPASS: audio-frequency, 600 ohms impedance, 595 ±42.5 Hz; 262413-2 (01534)	
1A1FL1-3		FILTER, BANDPASS: audio-frequency, 600 ohms impedance, 765 ±42.5 Hz; 262413-3 (01534)	
1A1FL1-4		FILTER, BANDPASS: audio-frequency, 600 ohms impedance; 935 ±42.5 Hz; 262413-4 (01534)	
1A1FL1-5		FILTER, BANDPASS: audio-frequency, 600 ohms impedance, 1105 ±42.5 Hz; 262413-5 (01534)	
1A1FL1-6		FILTER, BANDPASS: audio-frequency, 600 ohms impedance, 1275 ±42.5 Hz; 26413-6 (01534)	2-16

TABLE 6-2. TELEGRAPH TERMINAL AN/UCC-1D(V), MAINTENANCE PART LIST (Continued)

KEYER, FREQUENCY SHIFT, KY-558A(P)/UCC-1C(V), UNIT 1A1

REFERENCE DESIGNATION	NOTES	NAME AND DESCRIPTION	FIGURE NUMBER
1A1FL1-7		FILTER BANDPASS: audio-frequency, 600 ohms impedance, 1445 ±42.5 Hz; 262413-7 (01534)	2-16
1A1FL1-8		FILTER BANDPASS: audio-frequency, 600 ohms impedance, 1615 ±52.5 Hz; 262413-8 (01534)	
1A1FL1-9		FILTER, BANDPASS: audio-frequency, 600 ohms impedance, 1785 ±42.5 Hz;262413-9 (01534)	
1A1FL1-10		FILTER, BANDPASS: audio-frequency, 600 ohms impedance, 1955 ±42.5 Hz; 262413-10 (01534)	
1A1FL1-11		FILTER, BANDPASS: audio-frequency, 600 ohms impedance, 2125 ±42.5 Hz; 262413-11 (01534)	
1A1FL1-12		FILTER, BANDPASS: audio-frequency, 600 ohms impedance, 2295 ±42.5 Hz; 262413-12 (01534)	
1A1FL1-13		FILTER, BANDPASS: audio-frequency, 600 ohms impedance, 2465 ±42.5 Hz; 262413-13 (01534)	
1A1FL1-14		FILTER, BANDPASS: audio-frequency, 600 ohms impedance, 2635 ±42.5 Hz; 262413-14 (01534)	
1A1FL1-15		FILTER, BANDPASS: audio-frequency, 600 ohms impedance; 2805 ±42.5 Hz; 262413-15 (01534)	
1A1FL1-16		FILTER, BANDPASS: audio-frequency, 600 ohms impedance; 2975 ±42.5 Hz ; 262413-16 (01534)	
1A1J1		CONNECTOR, ELECTRICAL: 35 socket contacts: 37264727-001 (01534)	
1A1P1		CONNECTOR, ELECTRICAL: 38 socket contacts: 37264728-001 (01534)	
1A1S1		SWITCH, ROTARY: 4 PDT, screwdriver operated: 262363-1 (01534)	
1A1S2		Same as 1A1S1	
1A1T1		TRANSFORMER, POWER: step down, center tapped primary rated at 115/ 230 Vrms, center-tapped secondary rated at 28 Vrms, center-tapped secondary rated at 62 Vrms: 37264515-1 (01534)	
1A1XF1		FUSE BLOCK: single pole, clip type: 262380-1 (03614)	
1A1XY1		SOCKET, CRYSTAL: special purpose with 2 female contacts and integral retaining clip: 262606-1 (01534)	
1A1XY2		Same as 1A1XY1	
1A1Y1-1		CRYSTAL, FREQUENCY CONTROL: 48.960 kHz ±0.030%, 425 Hz channel: 262526-1 (01534)	
1A1Y1-2		CRYSTAL, FREQUENCY CONTROL: 70.720 kHz ±0.030%, 595 Hz channel: 262526-3 (01534)	
1A1Y1-3		CRYSTAL, FREQUENCY CONTROL: 92.480 kHz ±0.020%, 765 Hz channel: 262526-5 (01534)	
1A1Y1-4		CRYSTAL, FREQUENCY CONTROL: 114.240 kHz ±0.020%, 935 Hz channel: 262526-7 (01534)	
1A1Y1-5		CRYSTAL, FREQUENCY CONTROL: 136.000 kHz ±0.020%, 1105 Hz channel: 262526-9 (01534)	2-16

TABLE 6-2. TELEGRAPH TERMINAL AN/UCC-1D(V), MAINTENANCE PARTS LIST (Continued)

KEYER, FREQUENCY SHIFT, KY-558A(P)/UCC-1C(V), UNIT 1A1

REFERENCE DESIGNATION	NOTES	NAME AND DESCRIPTION	FIGURE NUMBER
1A1Y1-6		CRYSTAL, FREQUENCY CONTROL: 157.760 kHz, ±0.020%, 1275 Hz channel: 262526-11 (01534)	2-16
1A1Y1-7		CRYSTAL, FREQUENCY CONTROL: 179.520 kHz, ±0.020%, 1445 Hz channel: 262526-13 (01534)	
1A1Y1-8		CRYSTAL, FREQUENCY CONTROL: 201.280 kHz, +0.012%, -0.01%, 1615 Hz channel: 262526-15 (01534)	
1A1Y1-9		CRYSTAL, FREQUENCY CONTROL: 223.040 kHz, +0.012%, -0.01%, 1785 Hz channel: 262526-17 (01534)	
1A1Y1-10		CRYSTAL, FREQUENCY CONTROL: 244.800 kHz, +0.012%, -0.01%, 1955 Hz channel: 262526-19 (01534)	
1A1Y1-11		CRYSTAL, FREQUENCY CONTROL: 266.560 kHz, +0.012%, -0.01%, 2125 Hz channel: 262526-21 (01534)	
1A1Y1-12		CRYSTAL, FREQUENCY CONTROL: 288.320 kHz, +0.012%, -0.01%, 2295 Hz channel: 262526-23 (01534)	
1A1Y1-13		CRYSTAL, FREQUENCY CONTROL: 310.080 kHz, +0.012%, -0.01%, 2465 Hz channel: 262526-25 (01534)	
1A1Y1-14		CRYSTAL, FREQUENCY CONTROL: 331.840 kHz, +0.012%, -0.01%, 2635 Hz channel: 262526-27 (01534)	
1A1Y1-15		CRYSTAL, FREQUENCY CONTROL: 353.600 kHz, +0.012%, -0.01%, 2805 Hz channel: 262526-29 (01534)	
1A1Y1-16		CRYSTAL, FREQUENCY CONTROL: 375.360 kHz, +0.012%, -0.01%, 2975 Hz channel: 262526-31 (01534)	
1A1Y2-1		CRYSTAL, FREQUENCY CONTROL: 59.840 kHz, ±0.030%, 425 Hz channel: 262526-2 (01534)	
1A1Y2-2		CRYSTAL, FREQUENCY CONTROL: 81.600 kHz, ±0.030%, 595 Hz channel: 262526-4 (01534)	
1A1Y2-3		CRYSTAL, FREQUENCY CONTROL: 103.360 kHz, ±0.020%, 765 Hz channel: 262526-6 (01534)	
1A1Y2-4		CRYSTAL, FREQUENCY CONTROL: 125.120 kHz, ±0.020%, 935 Hz channel: 262526-8 (01534)	
1A1Y2-5		CRYSTAL, FREQUENCY CONTROL: 146.880 kHz, ±0.020%, 1105 Hz channel: 262526-10 (01534)	
1A1Y2-6		CRYSTAL, FREQUENCY CONTROL: 168.640 kHz, ±0.020%, 1275 Hz channel: 262526-12 (01534)	
1A1Y2-7		CRYSTAL, FREQUENCY CONTROL: 190.400 kHz, ±0.020%, 1445 Hz channel: 262526-14 (01534)	
1A1Y2-8		CRYSTAL, FREQUENCY CONTROL: 212.160 kHz, +0.012%, -0.01%, 1615 Hz channel: 262526-16 (01534)	2-16

TABLE 6-2. TELEGRAPH TERMINAL AN/UCC-1D(V), MAINTENANCE PARTS LIST (Continued)

KEYER, FREQUENCY SHIFT, KY-558A(P)/UCC-1C(V), UNIT 1A1

REFERENCE DESIGNATION	NOTES	NAME AND DESCRIPTION	FIGURE NUMBER
1A1Y2-9		CRYSTAL, FREQUENCY CONTROL: 233.920 kHz, +0.012%, -0.01%, 1785 Hz channel: 262526-18 (01534)	2-16
1A1Y2-10		CRYSTAL, FREQUENCY CONTROL: 255.680 kHz, +0.012%, -0.01%, 1995 Hz channel: 262526-20 (01534)	
1A1Y2-11		CRYSTAL, FREQUENCY CONTROL: 277.540 kHz, +0.012%, -0.01%, 2125 Hz channel: 262526-22 (01534)	
1A1Y2-12		CRYSTAL, FREQUENCY CONTROL: 299.200 kHz. +0.012%, -0.01%, 2295 Hz channel: 262526-24 (01534)	
1A1Y2-13		CRYSTAL, FREQUENCY CONTROL: 320.960 kHz, +0.012%, -0.01%, 2465 Hz channel: 262526-26 (01534)	
1A1Y2-14		CRYSTAL, FREQUENCY CONTROL: 342.720 kHz, +0.012%, -0.01%, 2635 Hz channel: 262526-28 (01534)	
1A1Y2-15		CRYSTAL, FREQUENCY CONTROL: 364.480 kHz, +0.012%, -0.01%, 2805 Hz channel: 262526-30 (01534)	
1A1Y2-16		CRYSTAL, FREQUENCY CONTROL: 386.240 kHz, +0.012%, -0.01%, 2975 Hz channel: 262526-32 (01534)	2-16

KEYER CHASSIS ASSEMBLY, FRONT, UNIT 1A1A1

REFERENCE DESIGNATION	NOTES	NAME AND DESCRIPTION	FIGURE NUMBER
1A1A1		KEYER CHASSIS ASSEMBLY, FRONT: plugs into keyer chassis assembly, rear, interchangeable in all channels: 37264507 (01534)	5-1
1A1A1C1	2	CAPACITOR: MIL type CM06DD681J03 (81349)	
1A1A1C2		Not used	
1A1A1C3		Not used	
1A1A1C4		CAPACITOR: MIL type CSR13BE225K (81349)	
1A1A1C5		Not used	
1A1A1C6		CAPACITOR: MIL type CSR13BB337K (81349)	
1A1A1C7	2	CAPACITOR: MIL type CM05ED240JN3 (81349)	
1A1A1C8		CAPACITOR: MIL type CSR13BB476K (81349)	
1A1A1C9		Same as 1A1A1C8	
1A1A1C10		Same as 1A1A1C7	
1A1A1C11	2	CAPACITOR: MIL type CM06FD152JN3 (81349)	5-1
1A1A1C12		Same as 1A1A1C11	

TABLE 6-2. TELEGRAPH TERMINAL AN1UCC-1D(V), MAINTENANCE PARTS LIST (Continued)

KEYER CHASSIS ASSEMBLY, FRONT, UNIT 1A1A1

REFERENCE DESIGNATION	NOTES	NAME AND DESCRIPTION	FIGURE NUMBER
1A1A1C13		Not used	5-1
1A1A1C14		Not used	
1A1A1C15		CAPACITOR: MIL type CSR13BF476K (81349)	
1A1A1C16		CAPACITOR: MIL type CSR13BE107K (81309)	
1A1A1C17		Same as 1A1A1C16	
1A1A1C18		CAPACITOR: MIL type CSR13BD157K (81349)	
1A1A1C19		Same as 1A1A1C16	
1A1A1C20		Same as 1A1A1C18	
1A1A1C21		Not used	
1A1A1C22		CAPACITOR: MIL type CSR13BE156K (81349)	
1A1A1C23		Same as 1A1A1C22	
1A1A1C24		Same as 1A1A1C16	
1A1A1C25		CAPACITOR: MIL type CSR13BB187K (81349)	
1A1A1C26		CAPACITOR: MIL type CM05E201JN3 (81349)	
1A1A1C27		Same as 1A1A1C26	
1A1A1CR1		DIODE: MIL type 1N483B (81349)	
1A1A1CR2		DIODE: MIL type 1N914 (81349)	
1A1A1CR3		Same as 1A1A1CR1	
1A1A1CR4		Same as 1A1A1CR2	
1A1A1CR5		DIODE: MIL type 1N754A (81349)	
1A1A1CR6		Same as 1A1A1CR5	
1A1A1CR7		Same as 1A1A1CR1	
1A1A1CR8		Not used	
1A1A1CR9		DIODE: MIL type 1N645 (81349)	
1A1A1CR10		Same as 1A1A1CR9	
1A1A1CR11		Same as 1A1A1CR9	
1A1A1CR12		Same as 1A1A1CR9	
1A1A1CR13		Same as 1A1A1CR9	
1A1A1CR14		Same as 1A1A1CR9	
1A1A1CR15		DIODE: MIL type 1N3022B (81349)	
1A1A1CR16		Same as 1A1A1CR5	
1A1A1CR17		DIODE: MIL type 1N748A (81349)	
1A1A1CR18		DIODE: MIL type 1N750A (81349)	
1A1A1CR19		Same as 1A1A1CR18	
1A1A1E1		SHORTING LOOP: jumper 262654 (01534)	
1A1A1F1		FUSE: MIL type F02B250V1/8A (81349)	
1A1A1IC1		Not used	
1A1A1IC2		INTEGRATED CIRCUIT DEVICE: flip-flop 262416-1 (01534)	
1A1A1IC3		Same as 1A1A1IC2	
1A1A1IC4		Same as 1A1A1IC2	
1A1A1IC5		Same as 1A1A1IC2	
1A1A1IC6		Same as 1A1A1IC2	
1A1A1IC7		Same as 1A1A1IC2	
1A1A1IC8		Same as 1A1A1IC2	
1A1A1IC9		INTEGRATED CIRCUIT DEVICE: differential amplifier: 262412-1 (01534)	5-1

TABLE 6-2. TELEGRAPH TERMINAL AN/UCC-1D(V), MAINTENANCE PARTS LIST (Continued)

KEYER CHASSIS ASSEMBLY, FRONT, UNIT 1A1A1

REFERENCE DESIGNATION	NOTES	NAME AND DESCRIPTION	FIGURE NUMBER
1A1A1IC10		Same as 1A1A1IC9	5-1
1A1A1J1		CONNECTOR, ELECTRICAL: 14 socket contacts: 262373-2 (01534)	
1A1A1J2		CONNECTOR, ELECTRICAL: tip jack: 262762-1 (01534)	
1A1A1J3		Same as 1A1A1J2	
1A1A1J4		Same as 1A1A1J2	
1A1A1P1		CONNECTOR, ELECTRICAL: 35 pin contacts: 262505-1 (01534)	
1A1A1Q1		TRANSISTOR: MIL type 2N1711 (81349)	
1A1A1Q2		Same as 1A1A1Q1	
1A1A1Q3		Same as 1A1A1Q1	
1A1A1Q4		Same as 1A1A1Q1	
1A1A1Q5		Same as 1A1A1Q1	
1A1A1Q6		Same as 1A1A1Q1	
1A1A1Q7		Same as 1A1A1Q1	
1A1A1R1 to 1A1A1R10		Not used	
1A1A1R11		RESISTOR: MIL type RC20GF562J (81349)	
1A1A1R12		Same as 1A1A1R11	
1A1A1R13		RESISTOR: MIL type RC20GF123J (81349)	
1A1A1R14		RESISTOR, VARIABLE: MIL type RV6NAYSL252A (81349)	
1A1A1R15		RESISTOR: MIL type RC20GF912J (81349)	
1A1A1R16		RESISTOR: MIL type RC20GF112J (81349)	
1A1A1R17		RESISTOR: MIL type RC20GF6R2J (81349)	
1A1A1R18		RESISTOR: MIL type RC20GF240J (81349)	
1A1A1R19		Same as 1A1A1R13	
1A1A1R20		NETWORK, RESISTANCE: 262414-5 (01534)	
1A1A1R21 to 1A1A1R23		Not used	
1A1A1R24		RESISTOR: MIL type RC20GF432J (81349)	
1A1A1R25		RESISTOR: MIL type RC20GF511J (81349)	
1A1A1R26		RESISTOR: MIL type RC20GF392J (81349)	
1A1A1R27 to 1A1A1R29		Not used	
1A1A1R30		Same as 1A1A1R20	
1A1A1R31		RESISTOR: MIL type RC20GF121J (81349)	
1A1A1R32		Not used	
1A1A1R33		RESISTOR: MIL type RC42GF101J (81349)	
1A1A1R34		RESISTOR: MIL type RC42GF820J (81349)	
1A1A1R35		RESISTOR: MIL type RC20GF330J (81349)	
1A1A1R36		RESISTOR: MIL type RC42GF391J (81349)	
1A1A1R37		RESISTOR: MIL type RC32GF181J (81349)	5-1

TABLE 6-2. TELEGRAPH TERMINAL AN/UCC-1D(V), MAINTENANCE PARTS LIST (Continued)

KEYER CHASSIS ASSEMBLY, FRONT, UNIT 1A1A1

REFERENCE DESIGNATION	NOTES	NAME AND DESCRIPTION	FIGURE NUMBER
1A1A1R38		RESISTOR: MIL type RC20GF202J (81349)	5-1
1A1A1R39		RESISTOR: MIL type RC42GF180J (81349)	
1A1A1R40		RESISTOR: MIL type RC42GF220J (81349)	
1A1A1R41		RESISTOR: MIL type RC32GF560J (81349)	
1A1A1R42		Same as 1A1A1R24	
1A1A1R43		Same as 1A1A1R25	
1A1A1R44		Same as 1A1A1R26	
1A1A1R45		RESISTOR: MIL type RC20GF390J (81349)	
1A1A1R46		Same as 1A1A1R45	
1A1A1R47		RESISTOR: MIL type RN60D6811F (81349)	
1A1A1R48		Same as 1A1A1R35	
1A1A1R49		RESISTOR: MIL type RC20GF103J (81349)	
1A1A1R50		RESISTOR: MIL type RC32GF470J (81349)	
1A1A1R51		RESISTOR: MIL type RC20GF152J (81349)	
1A1A1R52		RESISTOR: MIL type RC20GF821J (81349)	
1A1A1R53		RESISTOR: MIL type RN60D2211F (81349)	
1A1A1R54		RESISTOR: MIL type RN60D8871F (81349)	
1A1A1R55		RESISTOR: MIL type RN60D1822F (81349)	
1A1A1R56		RESISTOR: VARIABLE: MIL type RV6NAYSL502A (81349)	
1A1A1R57		RESISTOR: MIL type RC20GF151J (81349)	
1A1A1R58		RESISTOR: MIL type RC20GF203J (81349)	
1A1A1R59		Same as 1A1A1R49	
1A1A1R60		RESISTOR: MIL type RC20GF104J (81349)	
1A1A1R61		Same as 1A1A1R49	
1A1A1RT1		THERMISTOR: 37264513-1 (01534)	
1A1AS1		SWITCH, ROTARY: 4P3T, screwdriver operated: 262357-1 (01534)	
1A1A1S2		Not used	
1A1A1S3		SWITCH, ROTARY: SP2T, screwdriver operated: 262509-1 (01534)	
1A1A1XF1		FUSEHOLDER: MIL type FHL17G (81349)	5-1

TABLE 6-2. TELEGRAPH TERMINAL AN/UCC-1D(V), MAINTENANCE PARTS LIST (Continued)

CONVERTER, FREQUENCY SHIFT CV-1920A(P)/UCC-1C(V), UNIT 1A2

REFERENCE DESIGNATION	NOTES	NAME AND DESCRIPTION	FIGURE NUMBER
1A2		CONVERTER, FREQUENCY SHIFT: one channel (tone converter) which accepts a frequency shift keyed signal and converts to a d-c telegraph signal, provides high level 60 to 20 ma neutral or low level polar loop operation, switching to connect two modules; consists of converter chassis assembly, rear and converter chassis assembly, front: 37264511 (01534)	2-17
1A2-XX		CONVERTER CHASSIS ASSEMBLY, REAR: plugs into cabinet, electrical equipment, accepts plug-in converter chassis assembly, front: contains channel frequency determining components: part number varies with operating frequency	
		Frequency (Hz) — Part No.	
1A2-1		425 — 37264505-1	
1A2-2		595 — 37264505-2	
1A2-3		765 — 37264505-3	
1A2-4		935 — 37264505-4	
1A2-5		1105 — 37264505-5	
1A2-6		1275 — 37264505-6	
1A2-7		1445 — 37264505-7	
1A2-8		1615 — 37264505-8	
1A2-9		1785 — 37264505-9	
1A2-10		1955 — 37264505-10	
1A2-11		2125 — 37264505-11	
1A2-12		2295 — 37264505-12	
1A2-13		2465 — 37264505-13	
1A2-14		2635 — 37264505-14	
1A2-15		2805 — 37264505-15	
1A2-16		2975 — 37264505-16	
1A2FL1-1		FILTER, BANDPASS: audio-frequency, 425 ±42.5 Hz: 262429-1 (01534)	
1A2FL1-2		FILTER, BANDPASS: audio-frequency, 595 ±42.5 Hz: 262429-2 (01534)	
1A2FL1-3		FILTER, BANDPASS: audio-frequency, 765 ±42.5 Hz: 262429-3 (01534)	
1A2FL1-4		FILTER, BANDPASS: audio-frequency, 935 ±42.5 Hz: 262429-4 (01534)	
1A2FL1-5		FILTER, BANDPASS: audio-frequency, 1105 ±42.5 Hz: 262429-5 (01534)	
1A2FL1-6		FILTER, BANDPASS: audio-frequency, 1275 ±42.5 Hz: 262429-6 (01534)	
1A2FL1-7		FILTER, BANDPASS: audio-frequency, 1445 ±42.5 Hz: 262429-7 (01534)	
1A2FL1-8		FILTER, BANDPASS: audio-frequency, 1615 ±42.5 Hz: 262429-8 (01534)	2-17

TABLE 6-2. TELEGRAPH TERMINAL AN/UCC-1D(V), MAINTENANCE PARTS LIST (Continued)

CONVERTER, FREQUENCY SHIFT CV-1920A(P)/UCC-1C(V), UNIT 1A2

REFERENCE DESIGNATION	NOTES	NAME AND DESCRIPTION	FIGURE NUMBER
1A2FL1-9		FILTER, BANDPASS: audio-frequency, 1785 ±42.5 Hz: 262429-9 (01534)	2-17
1A2FL1-10		FILTER, BANDPASS: audio-frequency 1955 ±42.5 Hz: 262429-10 (01534)	
1A2FL1-11		FILTER, BANDPASS: audio-frequency 2125 ±42.5 Hz: 262429-11 (01534)	
1A2FL1-12		FILTER, BANDPASS: audio-frequency 2295 ±42.5 Hz: 262429-12 (01534)	
1A2FL1-13		FILTER, BANDPASS: audio-frequency 2465 ±42.5 Hz: 262429-13 (01534)	
1A2FL1-14		FILTER, BANDPASS: audio-frequency 2635 ±42.5 Hz: 262429-14 (01534)	
1A2FL1-15		FILTER, BANDPASS: audio-frequency 2805 ±42.5 Hz: 262429-15 (01534)	
1A2FL1-16		FILTER, BANDPASS: audio-frequency 2975 ±42.5 Hz: 262429-16 (01534)	
1A2FL2-1		FILTER, FREQUENCY: audio-frequency discriminator, mark frequency 467.5 ±3 Hz, space frequency 382.5 ±3 Hz, 425 Hz, channel: 262445-1 (01534)	
1A2FL2-2		FILTER, FREQUENCY: audio-frequency discriminator, mark frequency 637.5 ±3 Hz, space frequency 552.5 ±3 Hz, 595 Hz, channel: 262445-2 (01534)	
1A2FL2-3		FILTER, FREQUENCY: audio-frequency discriminator, mark frequency 807.5 ±3 Hz, space frequency 722.5 ±3 Hz, 765 Hz, channel: 262445-3 (01534)	
1A2FL2-4		FILTER, FREQUENCY: audio-frequency discriminator, mark frequency 977.5 ±3 Hz, space frequency 892.5 ±3 Hz, 935 Hz, channel: 262445-4 (01534)	
1A2FL2-5		FILTER, FREQUENCY: audio-frequency discriminator, mark frequency 1147.5 ±3 Hz, space frequency 1062.5 ±3 Hz, 1105 Hz, channel: 262445-5 (01534)	
1A2FL2-6		FILTER, FREQUENCY: audio-frequency discriminator, mark frequency 1317.5 ±3 Hz, space frequency 1232.5 ±3 Hz, 1275 Hz, channel: 262445-6 (01534)	
1A2FL2-7		FILTER, FREQUENCY: audio-frequency discriminator, mark frequency 1487.5 ±3 Hz, space frequency 1402.5 ±3 Hz, 1445 Hz, channel: 262445-7 (01534)	
1A2FL2-8		FILTER, FREQUENCY: audio-frequency discriminator, mark frequency 1657.5 ±3 Hz, space frequency 1572.5 ±3 Hz, 1615 Hz channel: 262445-8 (01534)	
1A2FL2-9		FILTER, FREQUENCY: audio-frequency discriminator, mark frequency 1827.5 ±3 Hz, space frequency 1742.5 ±3 Hz, 1785 cps channel: 262445-9 (01534)	2-17

TABLE 6-2. TELEGRAPH TERMINAL AN/UCC-1D(V), MAINTENANCE PARTS LIST (Continued)

CONVERTER, FREQUENCY SHIFT CV-1920A(P)/UCC-1C(V), UNIT 1A2

REFERENCE DESIGNATION	NOTES	NAME AND DESCRIPTION	FIGURE NUMBER
1A2FL2-10		FILTER, FREQUENCY: audio-frequency discriminator, mark frequency 1997.5 ±3 Hz, space frequency 1912.5 ±3 Hz, 1955 Hz, channel: 262445-10 (01534)	2-17
1A2FL2-11		FILTER, FREQUENCY: audio-frequency discriminator, mark frequency 2167.5 ±3 Hz, space frequency 2082.5 ±3 Hz, 2125 Hz channel: 262445-11 (01534)	
1A2FL2-12		FILTER, FREQUENCY: audio-frequency discriminator, mark frequency 2337.5 ±3 Hz, space frequency 2252.5 ±3 Hz, 2295 Hz channel: 262445-12 (01534)	
1A2FL2-13		FILTER, FREQUENCY: audio-frequency discriminator, mark frequency 2507.5 ±3 Hz, space frequency 2422.5 ±3 Hz, 2465 Hz, channel: 262445-13 (01534)	
1A2FL2-14		FILTER, FREQUENCY: audio-frequency discriminator, mark frequency 2677.5 ±3 Hz, space frequency 2692.5 ±3 Hz, 2635 Hz channel: 262445-14 (01534)	
1A2FL2-15		FILTER, FREQUENCY: audio-frequency discriminator, mark frequency 2847.5 ±3 Hz, space frequency 2762.5 ±3 Hz, 2805 Hz, channel: 262445-15 (01534)	
1A2FL2-16		FILTER, FREQUENCY: audio-frequency discriminator, mark frequency 3017.5 ±3 Hz, space frequency 2932.5 ±3 Hz, 2975 Hz, channel: 262445-16 (01534)	
1A2J1		CONNECTOR, ELECTRICAL: 35 socket contacts: 37264727-001 (01534)	
1A2P1		CONNECTOR, ELECTRICAL: 38 socket contacts: 37264728-001 (01534)	
1A2R1		RESISTOR, VARIABLE: MIL type RV6NAYSL253A (81349)	
1A2S1		SWITCH, ROTARY: 4P3T, screwdriver operated: 262357 (01534)	
1A2S2		SWITCH, ROTARY: 4PDT, screwdriver operated: 262363 (01534)	
1A2T1		TRANSFORMER, POWER: step-down center-tapped primary rated at 115/230 Vrms, center-tapped secondary rated at 28 Vrms: 37264514-1 (01534)	2-17

TABLE 6-2. TELEGRAPH TERMINAL AN/UCC-1D(V), MAINTENANCE PARTS LIST (Continued)

CONVERTER CHASSIS ASSEMBLY, FRONT, UNIT 1A2A1

REFERENCE DESIGNATION	NOTES	NAME AND DESCRIPTION	FIGURE NUMBER
1A2A1		CONVERTER CHASSIS ASSEMBLY, FRONT: plugs into converter chassis assembly, rear; interchangeable in all channels: 37264506 (01534)	5-2
1A2A1C1		Not used	
1A2A1C2		CAPACITOR: MIL type CSR13BF105K (81349)	
1A2A1C3		CAPACITOR: MIL type CSR13BE106K (81349)	
1A2A1C4		Same as 1A2A1C2	
1A2A1C5		Same as 1A2A1C3	
1A2A1C6		Same as 1A2A1C3	
1A2A1C7		Same as 1A2A1C3	
1A2A1C8		Same as 1A2A1C3	
1A2A1C9		Same as 1A2A1C3	
1A2A1C10		Same as 1A2A1C2	
1A2A1C11		CAPACITOR: MIL type CSR13G275K-L (81349)	
1A2A1C12		CAPACITOR: MIL type CS13BB157K (81349)	
1A2A1C13		CAPACITOR: MIL type CP05A1KB104K3 (81349)	
1A2A1C14		Not used	
1A2A1C15		Not used	
1A2A1C16		CAPACITOR: MIL type CSR13BF476K (81349)	
1A2A1C17		CAPACITOR: MIL type CSR13BE107K (81349)	
1A2A1C18		Same as 1A2A1C17	
1A2A1C19		CAPACITOR: MIL type CSR13G105K-L (81349)	
1A2A1C20		Not used	
1A2A1C21	2	CAPACITOR: MIL type CM06DD821JN3 (81349)	
1A2A1C22		Same as 1A2A1C2	
1A2A1C23		Not used	
1A2A1C24		Not used	
1A2A1C25		Not used	
1A2A1C26		Same as 1A2A1C2	
1A2A1C27	2	CAPACITOR: MIL type CM06DD272JN3 (81349)	
1A2A1C28		CAPACITOR: MIL type CS13BF475K (81349)	
1A2A1CR1		DIODE: MIL type 1N483B (81349)	
1A2A1CR2		Same as 1A2A1CR1	
1A2A1CR3		Same as 1A2A1CR1	
1A2A1CR4		Same as 1A2A1CR1	
1A2A1CR5		DIODE: MIL type 1N647 (81349)	
1A2A1CR6		DIODE: MIL type 1N756A (81349)	
1A2A1CR7		Same as 1A2A1CR1	
1A2A1CR8		Same as 1A2A1CR1	
1A2A1CR9		Same as 1A2A1CR1	
1A2A1CR10		Same as 1A2A1CR1	
1A2A1CR11		Same as 1A2A1CR1	
1A2A1CR12		Same as 1A2A1CR1	
1A2A1CR13		Same as 1A2A1CR1	
1A2A1CR14		Same as 1A2A1CR5	
1A2A1CR15		DIODE: MIL type 1N645 (81349)	5-2

TABLE 6-2. TELEGRAPH TERMINAL AN/UCC-1D(V), MAINTENANCE PARTS LIST (Continued)

CONVERTER CHASSIS ASSEMBLY, FRONT, UNIT 1A2A1

REFERENCE DESIGNATION	NOTES	NAME AND DESCRIPTION	FIGURE NUMBER
1A2A1CR16		Same as 1A2A1CR15	5-2
1A2A1CR17		Same as 1A2A1CR1	
1A2A1CR18		Same as 1A2A1CR1	
1A2A1CR19		Same as 1A2A1CR1	
1A2A1CR20		Same as 1A2A1CR1	
1A2A1CR21		DIODE: MIL type 1N3022B (81349)	
1A2A1CR22		Same as 1A2A1CR1	
1A2A1CR23		Same as 1A2A1CR1	
1A2A1CR24		Same as 1A2A1CR1	
1A2A1F1		FUSE: MIL type F02A250V 1/8 A (81349)	
1A2A1IC1	1	INTEGRATED CIRCUIT DEVICE: differential amplifier: 262412-2 (01534)	
1A2A1IC2		INTEGRATED CIRCUIT DEVICE: differential amplifier: 262412-1 (01534)	
1A2A1IC3		Same as 1A2A1IC2	
1A2A1IC4		Same as 1A2A1IC2	
1A2A1J1		CONNECTOR, ELECTRICAL: 14 socket contacts: 262373-2 (01534)	
1A2A1L1		INDUCTOR: 80 Henrys ±20%, d-c resistance 4500 ohms ±20%: 262415-1 (01534)	
1A2A1P1		CONNECTOR, ELECTRICAL: 35 pin contacts: 262505-1 (01534)	
1A2A1Q1		Not used	
1A2A1Q2		Not used	
1A2A1Q3		TRANSISTOR: MIL type 2N1711 (81349)	
1A2A1Q4		Same as 1A2A1Q3	
1A2A1Q5		Same as 1A2A1Q3	
1A2A1Q6		TRANSISTOR: high voltage: 262417 MIL type 2N3439 (01534)	
1A2A1Q7		Same as 1A2A1Q3	
1A2A1Q8		Same as 1A2A1Q3	
1A2A1Q9		Same as 1A2A1Q3	
1A2A1Q10		Same as 1A2A1Q3	
1A2A1Q11		Same as 1A2A1Q3	
1A2A1R1		RESISTOR, VARIABLE: MIL type RV6NAYSL104E (81349)	
1A2A1R2		NETWORK, RESISTANCE: 262414-2 (01534)	
1A2A1R3		NETWORK, RESISTANCE: 262414-7 (01534)	
1A2A1R4		NETWORK, RESISTANCE: 262414-1 (01534)	
1A2A1R5		Same as 1A2A1R4	
1A2A1R6		RESISTOR: MIL type RC20GF125J (81349)	
1A2A1R7		Not used	
1A2A1R8		RESISTOR: MIL type RC20GF220J (81349)	
1A2A1R9		RESISTOR: MIL type RC20GF202J (81349)	
1A2A1R10		RESISTOR: MIL type RC20GF153J (81349)	
1A2A1R11		RESISTOR: MIL type RC20GF472J (81349)	
1A2A1R12		Same as 1A2A1R11	5-2

TABLE 6-2. TELEGRAPH TERMINAL AN/UCC-1D(V), MAINTENANCE PARTS LIST (Continued)

CONVERTER CHASSIS ASSEMBLY, FRONT, UNIT 1A2A1

REFERENCE DESIGNATION	NOTES	NAME AND DESCRIPTION	FIGURE NUMBER
1A2A1R13		RESISTOR: MIL type RC20GF823J (81349)	5-2
1A2A1R14		RESISTOR, VARIABLE: MIL type RV6NAYSL102A (81349)	
1A2A1R15		Same as 1A2A1R9	
1A2A1R16		NETWORK, RESISTANCE: 262414-6 (01534)	
1A2A1R17		RESISTOR: MIL type RC20G F621 (81349)	
1A2A1R18		RESISTOR: MIL type RC20GF913J (81349)	
1A2A1R19		RESISTOR: MIL type RC20GF563J (81349)	
1A2A1R20		Same as 1A2A1R19	
1A2A1R21		RESISTOR: MIL type RC20GF103J (81349)	
1A2A1R22		RESISTOR: MIL type RC20GF100J (81349)	
1A2A1R23		RESISTOR: MIL type RC32GF470J (81349)	
1A2A1R24		Same as 1A2A1R13	
1A2A1R25		Same as 1A2A1R21	
1A2A1R26		RESISTOR, VARIABLE: MIL type RV6NAYSL252A (81349)	
1A2A1R27		RESISTOR: MIL type RC20GF621J (81349)	
1A2A1R28		Not used	
1A2A1R29		Not used	
1A2A1R30		Not used	
1A2A1R31		RESISTOR: MIL type M23379/2-00867 (81349)	
1A2A1R32		Same as 1A2A1R31	
1A2A1R33		RESISTOR: MIL type RC42GF470J (81349)	
1A2A1R34		RESISTOR: MIL type RC20G F514J(81349)	
1A2A1R35		Not used	
1A2A1R36		Not used	
1A2A1R37		RESISTOR: MIL type RC20G F511 J(81349)	
1A2A1S1		SWITCH, ROTARY: 4P3T, screwdriver operated: 262357-1 (01534)	
1A2A1T1		TRANSFORMER, AUDIO FREQUENCY: interstage coupling: 262422-1 (01534)	
1A2A1XF1		FUSEHOLDER: MIL type FHL17G (81349)	5-2

TABLE 6-2. TELEGRAPH TERMINAL AN/UCC-1D(V), MAINTENANCE PARTS LIST (Continued)

CONTROL ATTENUATOR C-6554A/UCC-1C(V), UNIT 1A3

REFERENCE DESIGNATION	NOTES	NAME AND DESCRIPTION	FIGURE NUMBER
1A3		CONTROL-ATTENUATOR: provides connection of composite audio-frequency lines to connectors at rear of cabinet, control input/output level, provides selection of mode of operation (master or slave), contains fuses and switch for cabinet a-c power; consists of control-attenuator chassis assembly, rear, control-attenuator chassis assembly, front, and test adapter: 37264530 (01534)	2-15
1A3-1		CONTROL-ATTENUATOR CHASSIS ASSEMBLY, REAR: plugs into cabinet, electrical equipment; accepts plug-in control attenuator chassis assembly, front, interchangeable in all cabinets: 37264528 (01534)	
1A3J1		CONNECTOR, ELECTRICAL: 35 socket contacts: 37264727-001 (01534)	
1A3P1		CONNECTOR, ELECTRICAL: 38 socket contacts: 37264728-001 (01534)	
1A3S1		SWITCH, ROTARY: 4PDT, screwdriver operated: 262363-1 (01534)	
1A3T1		TRANSFORMER, COUPLING: audio-frequency 300 to 4,000 Hz, 2 balanced 150-ohm input windings, center-tapped 600-ohm output winding: 262461-1 (01534)	
1A3T2		Same as 1A3T1	
1A3T3		Same as 1A3T1	
1A3T4		Same as 1A3T1	
1A3T5		TRANSFORMER, POWER: step-down center-tapped primary rated at 115/230 Vrms, center-tapped secondary rated at 28 Vrms: 37264514-1 (01534)	2-15

CONTROL ATTENUATOR CHASSIS ASSEMBLY, FRONT, UNIT 1A3A1

REFERENCE DESIGNATION	NOTES	NAME AND DESCRIPTION	FIGURE NUMBER
1A3A1		CONTROL-ATTENUATOR CHASSIS ASSEMBLY, FRONT: Plugs into control attenuator chassis assembly, rear; interchangeable in all cabinets: 262596 (01534)	5-3
1A3A1C1		CAPACITOR: MIL type CSR13BF105K (81349)	
1A3A1C2		CAPACITOR: MIL type CSR13BF226K (81349)	
1A3A1C3		Same as 1A3A1C2	
1A3A1C4		CAPACITOR: MIL type CL23CE200UN3 (81349)	
1A3A1C5		CAPACITOR: MIL type CSR13BE106K (81349)	5-3

TABLE 6-2. TELEGRAPH TERMINAL AN/UCC-1D(V), MAINTENANCE PARTS LIST (Continued)

CONTROL ATTENUATOR CHASSIS ASSEMBLY, FRONT, UNIT 1A3A1

REFERENCE DESIGNATION	NOTES	NAME AND DESCRIPTION	FIGURE NUMBER
1A3A1C6		Same as 1A3A1C5	5-3
1A3A1C7		CAPACITOR: MIL type CSR13BB476K (81349)	
1A3A1C8	2	CAPACITOR: MIL type CM07FD682J03 (81349)	
1A3A1C9		CAPACITOR: MIL type CP05A1EF103K (81349)	
1A3A1C10		Same as 1A3A1C9	
1A3A1C11		CAPACITOR: MIL type CSR13BF476K (81349)	
1A3A1C12		CAPACITOR: MIL type CSR13BE107K (81349)	
1A3A1C13		Same as 1A3A1C12	
1A3A1C14	2	CAPACITOR: MIL type CM06DD681J03 (81349)	
1A3A1C15		Same as 1A3A1C2	
1A3A1CR1		DIODE: MIL type 1N483B (81349)	
1A3A1CR2		Same as 1A3A1CR1	
1A3A1CR3		DIODE: MIL type 1N645 (81349)	
1A3A1CR4		Same as 1A3A1CR3	
1A3A1CR5		DIODE: MIL type 1N3022B (81349)	
1A3A1DS1		LAMP: MIL type MS25252-NE-2D (96906)	
1A3A1F1		FUSE: MIL type F02B250V1A (81349)	
1A3A1F2		Same as 1A3A1F1	
1A3A1F3		FUSE: MIL type F02A250V 1/8A (81349)	
1A3A1IC1		INTEGRATED CIRCUIT DEVICE: differential amplifier: 262412-1 (01534)	
1A3A1IC2		Same as 1A3A1IC1	
1A3A1J1		CONNECTOR, ELECTRICAL: 14 socket contacts: 262373-2 (01534)	
1A3A1L1		INDUCTOR: MIL type MS16223-20 (96906)	
1A3A1P1		CONNECTOR, ELECTRICAL: 35 pin contacts: 262505-1 (01534)	
1A3A1Q1		TRANSISTOR: dual: 2N2060: 262428 (01534)	
1A3A1Q2		TRANSISTOR: MIL type 2N1711 (81349)	
1A3A1R1		RESISTOR: MIL type RC20GF151J (81349)	
1A3A1R2		NETWORK, RESISTANCE: 262414-4 (01534)	
1A3A1R3		RESISTOR: MIL type RC20GF220J (81349)	
1A3A1R4		NETWORK, RESISTANCE: 262414-1 (01534)	
1A3A1R5		RESISTOR: MIL type RC20GF562J (81349)	
1A3A1R6		RESISTOR: MIL type RC20GF150J (81349)	
1A3A1R7		RESISTOR: MIL type RC20GF102J (81349)	
1A3A1R8		RESISTOR, VARIABLE: MIL type RT11C2P502 (81349)	
1A3A1R9		RESISTOR: MIL type RC20GF103J (81349)	
1A3A1R10		Same as 1A3A1R5	
1A3A1R11		RESISTOR: MIL type RC20GF101J (81349)	
1A3A1R12		RESISTOR: MIL type RC20GF181J (81349)	
1A3A1R13		Same as 1A3A1R7	
1A3A1R14		RESISTOR: MIL type M23379/200954 (81349)	
1A3A1R15		RESISTOR: MIL type M23379/200918 (81349)	
1A3A1R16		RESISTOR: MIL type RC20GF330J (81349)	
1A3A1S1		SWITCH, TOGGLE: MIL type MS35059-21 (96906)	5-3

TABLE 6-2. TELEGRAPH TERMINAL AN/UCC-1D(V), MAINTENANCE PARTS LIST (Continued)

CONTROL ATTENUATOR CHASSIS ASSEMBLY, FRONT, UNIT 1A3A1

REFERENCE DESIGNATION	NOTES	NAME AND DESCRIPTION	FIGURE NUMBER
1A3A1T1		TRANSFORMER, AUDIO FREQUENCY: interstage coupling: 262462-1 (01534)	5-3
1A3A1XDS1		LAMPHOLDER: MIL type LH74LC13YN (81349)	
1A3A1XF1		FUSEHOLDER: MIL type FHL17G (81349)	
1A3A1XF2		Same as 1A3A1XF1	
1A3A1XF3		Same as 1A3A1XF1	
1A3A2		TEST ADAPTER: 262626 (01534)	
1A3A2J1		CONNECTOR, ELECTRICAL: 38 pin contacts: 37264728-002 (01534)	
1A3A2J2		CONNECTOR, ELECTRICAL: 3 prong contacts: 262669-1 (01534)	
1A3A2TB1		TERMINAL BLOCK: MIL type 40TB3 (81349)	
1A3A2TB2		Same as 1A3A2TB1	5-3

TEST SET, TELEGRAPH TS-2232A/UCC-1C(V), UNIT 2

REFERENCE DESIGNATION	NOTES	NAME AND DESCRIPTION	FIGURE NUMBER
2		TEST SET, TELEGRAPH: a d-c microammeter and associated switching, tone generator, mark and space generator, audio-frequency amplifier and loudspeaker: 37264520 (01534)	5-4
2C1		CAPACITOR: MIL type CP91B1KE105K1 (81349)	
2C2		CAPACITOR: MIL type CP05A1KF682K3 (81349)	
2DS1		LAMP: MIL type MS25252-NE-2D (96906)	
2F1		FUSE, CARTRIDGE: MIL type F02A250V 1/8A (81349)	
2F2		Same as 2F1	
2FL1		FILTER, LINE: radio-frequency interference 262447-1 (01534)	
2J1		JACK, TELEPHONE: MIl type JJ-089 (81349)	
2J2		Same as 2J1	
2L1		INDUCTOR: MIL type MS16223-20 (81349)	
2LS1		LOUDSPEAKER: permanent magnet type, input impedance 950 ohms ±15% at 1000 Hz: 262423-1 (01534)	
2M1		METER, ELECTRICAL: volts/milliamperes; zero center, 50 microamperes negative/50 microamperes positive: 262339-1 (01534)	
2P1		CONNECTOR, ELECTRICAL: 14 pin contacts: 262373-1 (01534)	
2P2		CONNECTOR, ELECTRICAL: MIL type UP121M (81349)	5-4

TABLE 6-2. TELEGRAPH TERMINAL AN/UCC-1D(V), MAINTENANCE PARTS LIST (Continued)

TEST SET, TELEGRAPH TS-2232A/UCC-1C(V), UNIT 2

REFERENCE DESIGNATION	NOTES	NAME AND DESCRIPTION	FIGURE NUMBER
2R1		RESISTOR, VARIABLE: MIL type RV4NAYSB104A (81349)	5-4
2R2		Same as 2R1	
2S1		SWITCH, ROTARY: 4 position: 262342-1 (01534)	
2S2		SWITCH, ROTARY: 9 position: 262344-1 (01534)	
2S3		SWITCH, TOGGLE: MIL type MS35058-23 (96906)	
2S4		SWITCH, ROTARY: 20 position: 262345-1 (01534)	
2S5		SWITCH, TOGGLE: MIL MS35059-21 (96906)	
2T1		TRANSFORMER, POWER: step down, center-tapped primary rated at 115/230 Vrms, center-tapped secondary rated at 28 Vrms, center-tapped secondary rated at 62 Vrms: 37264515-1 (01534)	
2T2		TRANSFORMER, AUDIO FREQUENCY: interstage coupling; two 150-ohm primary windings, 600-ohm center-tapped secondary winding: 262461-1 (01534)	
2TP1		JACK, TIP: MIL type MS16108-1A (96906)	
2TP2		JACK, TIP: MIL type MS16108-5A (96906)	
2TP3		JACK, TIP: MIL type MS16108-6A (96906)	
2TP4		JACK, TIP: MIL type MS16108-7A (96906)	
2TP5		JACK, TIP: MIL type MS16108-8A (96906)	
2TP6		JACK, TIP: MIL type MS16108-9A (96906)	
2TP7		JACK, TIP: MIL type MS16108-3A (96906)	
2XA1		CONNECTOR, ELECTRICAL: 41 socket contacts: 37264727-002 (01534)	
2XA2		Same as 2XA1	
2XDS1		LAMPHOLDER: MIL type LH74LC13Y7 (81349)	
2XF1		FUSEHOLDER: MIL type FHL17G (81349)	
2XF2		Same as 2XF1	
2XY1		SOCKET, CRYSTAL: MIL type TS0205C01 (81349)	
2XY2		Same as 2XY1	
2XY3		Same as 2XY1	
2XY4		Same as 2XY1	
2XY5		Same as 2XY1	
2XY6		Same as 2XY1	
2XY7		Same as 2XY1	
2XY8		Same as 2XY1	
2XY9		Same as 2XY1	
2XY10		Same as 2XY1	
2XY11		Same as 2XY1	
2XY12		Same as 2XY1	
2Y1		CRYSTAL, FREQUENCY CONTROL: 112.200 kHz ±0.020%: 262526-36 (01534)	
2Y2		CRYSTAL, FREQUENCY CONTROL: 91.840 kHz ±0.020%: 262526-33 (01534)	5-4

TABLE 6-2. TELEGRAPH TERMINAL AN/UCC-1D(V), MAINTENANCE PARTS LIST (Continued)

TEST SET, TELEGRAPH TS-2232A(P)/UCC-1C(V), UNIT 2

REFERENCE DESIGNATION	NOTES	NAME AND DESCRIPTION	FIGURE NUMBER
2Y3		CRYSTAL, FREQUENCY CONTROL: 155.040 kHz ±0.020%: 262526-38 (01534)	5-4
2Y4		CRYSTAL, FREQUENCY CONTROL: 104.076 kHz ±0.020%: 262526-34 (01534)	
2Y5		CRYSTAL, FREQUENCY CONTROL: 165.920 kHz ±0.020%: 262526-41 (01534)	
2Y6		CRYSTAL, FREQUENCY CONTROL: 157.731 kHz ±0.020%: 262426-39 (01534)	
2Y7		CRYSTAL, FREQUENCY CONTROL: 106.053 kHz ±0.020%: 262526-35 (01534)	
2Y8		CRYSTAL, FREQUENCY CONTROL: 150.920 kHz ±0.020%: 262526-37 (01534)	
2Y9		CRYSTAL, FREQUENCY CONTROL: 160.420 kHz ±0.020%: 262526-40 (01534)	
2Y10		CRYSTAL, FREQUENCY CONTROL: 171.322 kHz ±0.020%: 262526-42 (01534)	
2Y11		CRYSTAL, FREQUENCY CONTROL: 182.240 kHz ±0.020%: 262526-43 (01534)	
2Y12		CRYSTAL, FREQUENCY CONTROL: 187.680 kHz ±0.020%: 262426-44 (01534)	5-4

CARD ASSEMBLY, COUNTER, UNIT 2A1

REFERENCE DESIGNATION	NOTES	NAME AND DESCRIPTION	FIGURE NUMBER
2A1		CARD ASSEMBLY, COUNTER: a printed circuit board which mounts and supplies the circuitry for the below listed items: 262679 (01534)	5-5
2A1C1		Not used	
2A1C2		Not used	
2A1C3		Not used	
2A1C4	2	CAPACITOR: MIL type CM05ED510JN3 (81349)	
2A1C5		Same as 2A1C4	
2A1C6		Same as 2A1C4	
2A1C7		Same as 2A1C4	
2A1C8		Same as 2A1C4	
2A1C9		Same as 2A1C4	
2A1C10		CAPACITOR: MIL type CSR13BE107K (81349)	
2A1C11		Same as 2A1C10	
2A1C12		Same as 2A1C10	
2A1C13		CAPACITOR: MIL type CSR13BD157K (81349)	5-5
2A1C14		Same as 2A1C13	

TABLE 6-2. TELEGRAPH TERMINAL AN/UCC-1D(V), MAINTENANCE PARTS LIST (Continued)

CARD ASSEMBLY, COUNTER, UNIT 2A1

REFERENCE DESIGNATION	NOTES	NAME AND DESCRIPTION	FIGURE NUMBER
2A1C15		CAPACITOR: MIL type CSR13BF105K (81349)	5-5
2A1CR1		DIODE: MIL type 1N483B (81349)	
2A1CR2		Same as 2A1CR1	
2A1CR3		Same as 2A1CR1	
2A1CR4		Same as 2A1CR1	
2A1CR5		Same as 2A1CR1	
2A1CR6		Same as 2A1CR1	
2A1CR7		Same as 2A1CR1	
2A1CR8		Same as 2A1CR1	
2A1CR9		Same as 2A1CR1	
2A1CR10		Same as 2A1CR1	
2A1CR11		Same as 2A1CR1	
2A1CR12		Same as 2A1CR1	
2A1CR13		Same as 2A1CR1	
2A1CR14		Same as 2A1CR1	
2A1CR15		Same as 2A1CR1	
2A1CR16		Same as 2A1CR1	
2A1CR17		Same as 2A1CR1	
2A1CR18		Same as 2A1CR1	
2A1CR19		Same as 2A1CR1	
2A1CR20		Same as 2A1CR1	
2A1CR21		Same as 2A1CR1	
2A1CR22		Same as 2A1CR1	
2A1CR23		Same as 2A1CR1	
2A1CR24		Same as 2A1CR1	
2A1CR25		Same as 2A1CR1	
2A1CR26		Same as 2A1CR1	
2A1CR27		Same as 2A1CR1	
2A1CR28		Same as 2A1CR1	
2A1CR29		Same as 2A1CR1	
2A1CR30		Same as 2A1CR1	
2A1CR31		Same as 2A1CR1	
2A1CR32		Same as 2A1CR1	
2A1CR33		Same as 2A1CR1	
2A1CR34		Same as 2A1CR1	
2A1CR35		Same as 2A1CR1	
2A1CR36		Same as 2A1CR1	
2A1CR37		Same as 2A1CR1	
2A1CR38		Same as 2A1CR1	
2A1CR39		Same as 2A1CR1	
2A1CR40		Same as 2A1CR1	
2A1CR41		Same as 2A1CR1	
2A1CR42		Same as 2A1CR1	
2A1CR43		Same as 2A1CR1	
2A1CR44		Same as 2A1CR1	
2A1CR45		Same as 2A1CR1	5-5

TABLE 6-2. TELEGRAPH TERMINAL AN/UCC-1D(V), MAINTENANCE PARTS LIST (Continued)

CARD ASSEMBLY, COUNTER, UNIT 2A1

REFERENCE DESIGNATION	NOTES	NAME AND DESCRIPTION	FIGURE NUMBER
2A1CR46		Same as 2A1CR1	5-5
2A1CR47		Same as 2A1CR1	
2A1CR48		Same as 2A1CR1	
2A1CR49		Same as 2A1CR1	
2A1CR50		Same as 2A1CR1	
2A1CR51		Same as 2A1CR1	
2A1CR52		Same as 2A1CR1	
2A1CR53		Same as 2A1CR1	
2A1CR54		Same as 2A1CR1	
2A1CR55		Same as 2A1CR1	
2A1CR56		Same as 2A1CR1	
2A1CR57		Not used	
2A1CR58		Not used	
2A1CR59		DIODE: MIL type 1N748 (81349)	
2A1IC1		INTEGRATED CIRCUIT DEVICE: flip-flop 262416-1 (01534)	
2A1IC2		Same as 2A1IC1	
2A1IC3		Same as 2A1IC1	
2A1IC4		Same as 2A1IC1	
2A1IC5		Same as 2A1IC1	
2A1IC6		Same as 2A1IC1	
2A1IC7		Same as 2A1IC1	
2A1IC8		Same as 2A1IC1	
2A1P1		CONNECTOR, ELECTRICAL: 41 pin contacts: 262505-2 (01534)	
2A1Q1		TRANSISTOR: MIL type 2N1711 (81349)	
2A1R1		Not used	
2A1R2		Not used	
2A1R3		Not used	
2A1R4		RESISTOR: MIL type RC42GF150J (81349)	
2A1R5		RESISTOR: MIL type RC42GF220J (81349)	
2A1R6		RESISTOR: MIL type RC20GF221J (81349)	
2A1R7		RESISTOR: MIL type RC20GF151J (81349)	
2A1R8		RESISTOR: MIL type RC32GF680J (81349)	5-5

TABLE 6-2. TELEGRAPH TERMINAL AN/UCC-1D(V), MAINTENANCE PARTS LIST (Continued)

CARD ASSEMBLY, AMPLIFIER, UNIT 2A2

REFERENCE DESIGNATION	NOTES	NAME AND DESCRIPTION	FIGURE NUMBER
2A2		CARD ASSEMBLY, AMPLIFIER: a printed circuit board which mounts and supplies the circuitry for the below listed items: 37264519 (01534)	5-6
2A2P1		CONNECTOR, ELECTRICAL: 41 pin contacts: 262505-2 (01534)	
2A2C1		CAPACITOR: MIL type CP05A1KB154K3 (81349)	
2A2C2		Same as 2A2C1	
2A2C3		CAPACITOR: MIL type CSR13BF475K (81349)	
2A2C4		CAPACITOR: MIL type CSR13BF156K (81349)	
2A2C5		CAPACITOR: MIL type CSR13BF226K (81349)	
2A2C6		Same as 2A2C3	
2A2C7		Same as 2A2C4	
2A2C8		CAPACITOR: MIL type CSR13BE107K (81349)	
2A2C9		Not used	
2A2C10		CAPACITOR: MIL type CSR13BF476K (81349)	
2A2C11		Same as 2A2C8	
2A2C12		Not used	
2A2C13		CAPACITOR: MIL type CSR13BE225K (81349)	
2A2C14	2	CAPACITOR MIL type CM06DD821JN3 (81349)	
2A2C15	2	CAPACITOR: MIL type CM06DD102JN3 (81349)	
2A2C16		Same as 2A2C10	
2A2CR1		DIODE: MIL type 1N483B (81349)	
2A2CR2		Same as 2A2CR1	
2A2CR3		Same as 2A2CR1	
2A2CR4		Same as 2A2CR1	
2A2CR5		Same as 2A2CR1	
2A2CR6		DIODE: MIL type 1N647 (81349)	
2A2CR7		DIODE: MIL type 1N645 (81349)	
2A2CR8		Same as 2A2CR7	
2A2CR9		DIODE: MIL type 1N3022B (81349)	
2A2CR10		Same as 2A2CR7	
2A2CR11		Same as 2A2CR1	
2A2CR12		Same as 2A2CR1	
2A2CR13		Same as 2A2CR1	
2A2CR14		Same as 2A2CR6	
2A2CR15		Same as 2A2CR6	
2A2CR16		Same as 2A2CR6	
2A2CR17		Same as 2A2CR6	
2A2IC1		INTEGRATED CIRCUIT DEVICE: differential amplifier: 262412-1 (01534)	
2A2Q1		TRANSISTOR: MIL type 2N1711 (81349)	
2A2Q2		TRANSISTOR: dual: 2N2060: 262428 (01534)	
2A2Q3		Same as 2A2Q1	
2A2R1		RESISTOR: MIL type RC20GF753J (81349)	
2A2R2		Not used	
2A2R3		RESISTOR: MIL type RN60D1333F (81349)	5-6

TABLE 6-2. TELEGRAPH TERMINAL AN/UCC-1D(V), MAINTENANCE PARTS LIST (Continued)

CARD ASSEMBLY, AMPLIFIER, UNIT 2 A2

REFERENCE DESIGNATION	NOTES	NAME AND DESCRIPTION	FIGURE NUMBER
2 A2 R4		RESISTOR: MIL type RC20GF223J (81349)	5-6
2 A2 R5		RESISTOR: MIL type RC20GF563J (81349)	
2 A2 R6		Same as 2 A2 R4	
2 A2 R7		RESISTOR: MIL type RC20GF561J (81349)	
2 A2 R8		RESISTOR: MIL type RC20GF823J (81349)	
2 A2 R9		RESISTOR: MIL type RC20GF101J (81349)	
2 A2 R10		RESISTOR: MIL type RC20GF100J (81349)	
2 A2 R11		RESISTOR: MIL type RC20GF472J (81349)	
2 A2 R12		RESISTOR: MIL type RC20GF103J (81349)	
2 A2 R13		RESISTOR: MIL type RC20GF220J (81349)	
2 A2 R14		Same as 2 A2 R7	
2 A2 R15		RESISTOR: MIL type RN60D3162F (81349)	
2 A2 R16		RESISTOR: MIL type RC32GF301J (81349)	
2 A2 R17		Not used	
2 A2 R18		RESISTOR: MIL type RC20GF164J (81349)	
2 A2 R19		Not used	
2 A2 R20		Same as 2 A2 R1	
2 A2 R21		Not used	
2 A2 R22		Not used	
2 A2 R23		RESISTOR: MIL type RN60D1133F (81349)	
2 A2 R24		RESISTOR: MIL type RN60D4753F (81349)	
2 A2 R25		RESISTOR: MIL type RN60D2673F (81349)	
2 A2 R26		RESISTOR: MIL type RN60D1213F (81349)	
2 A2 R27		RESISTOR: MIL type RN60D9312F (81349)	
2 A2 R28		RESISTOR: MIL type RN60D4023F (81349)	
2 A2 R29		RESISTOR: MIL type RN60D2003F (81349)	
2 A2 R30		Same as 2 A2 R29	
2 A2 R31		RESISTOR: MIL type RC20GF333J (81349)	
2 A2 R32		Same as 2 A2 R12	
2 A2 R33		RESISTOR: MIL type RC32GF750J (81349)	
2 A2 R34		RESISTOR: MIL type RC32GF470J (81349)	
2 A2 R35		RESISTOR: MIL type RC20GF330J (81349)	
2 A2 R36		RESISTOR: MIL type RC20GF361J (81349)	
2 A2 R37		RESISTOR: MIL type RC20GF102J (81349)	
2 A2 R38		Same as 2 A2 R37	
2 A2 R39		RESISTOR: MIL type RC20GF201J (81349)	
2 A2 R40		Same as 2 A2 R12	
2 A2 R41		Same as 2 A2 R12	
2 A2 R42		RESISTOR: MIL type RC20GF222J (81349)	
2 A2 R43		Same as 2 A2 R31	
2 A2 R44		RESISTOR: MIL type RC20GF622J (81349)	
2 A2 R45		RESISTOR: MIL type RC20GF112J (81349)	
2 A2 R46		RESISTOR: MIL type RC32GF223J (81349)	5-6

TABLE 6-2. TELEGRAPH TERMINAL AN/UCC-1D(V), MAINTENANCE PARTS LIST (Continued)

CARD ASSEMBLY, OSCILLATOR, UNIT 2A3

REFERENCE DESIGNATION	NOTES	NAME AND DESCRIPTION	FIGURE NUMBER
2A3		CARD ASSEMBLY, OSCILLATOR: a printed circuit board mounts and supplies the circuitry for the below listed items: 262677 (01534)	5-7
2A3C1	2	CAPACITOR: MIL type CM06FD152JN3 (81349)	
2A3C2	2	CAPACITOR: MIL type CM05ED680JN3 (81349)	
2A3C3		Not used	
2A3C4		CAPACITOR: MIL type CSR13BF475K (81349)	
2A3C5		CAPACITOR: MIL type CSR13BE107K (81349)	
2A3IC1		INTEGRATED CIRCUIT DEVICE: differential amplifier: 262412-1 (01534)	
2A3R1		RESISTOR: MIL type RC20GF471J (81349)	
2A3R2		RESISTOR: MIL type RC20GF242J (81349)	
2A3R3		RESISTOR: MIL type RC20GF472J (81349)	
2A3R4		RESISTOR: MIL type RC20GF123J (81349)	
2A3R5		Same as 2A3R4	
2A3R6		RESISTOR: MIL type RC20GF621J (81349)	
2A3R7		RESISTOR: MIL type RC20GF222J (81349)	
2A3R8		Same as 2A3R7	
2A3R9		RESISTOR: MIL type RC20GF561J (81349)	
2A3R10		RESISTOR: MIL type RC20GF331J (81349)	5-7

TABLE 6-3. LIST OF MANUFACTURERS

MFG CODE	NAME	ADDRESS
01534	Honeywell Inc., Ordnance Division	Seattle, Washington
03614	McGraw-Edison Company Bussmann Mfg. Division	St. Louis, Missouri
05397	Kemet Company	Cleveland, Ohio
74545	Harvey Hubbel Inc.	Bridgeport, Connecticut
81073	Grayhill Inc.	La Grange, Illinois
81349	Military Specifications	
91506	Augat Bros., Inc.	Attleboro, Massachusetts
91662	Elco Corporation	Willow Grove, Pennsylvania
91929	Honeywell Inc., Micro-Switch Division	Freeport, Illinois
96906	Military Standards	

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Ship or Station_____

Name_____

Rank_____

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